The Electrical Industry's Weekly Magazine December 21, 1959

Electrical World

Price 50 Cents

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1959

Electric Utility Methods offers methods and tools for construction, operation and

starts on page

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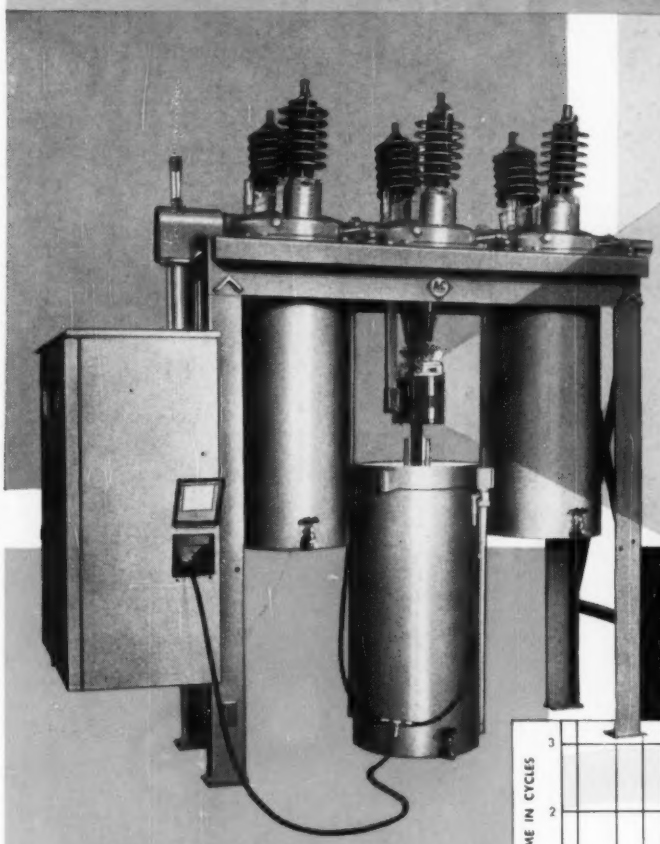
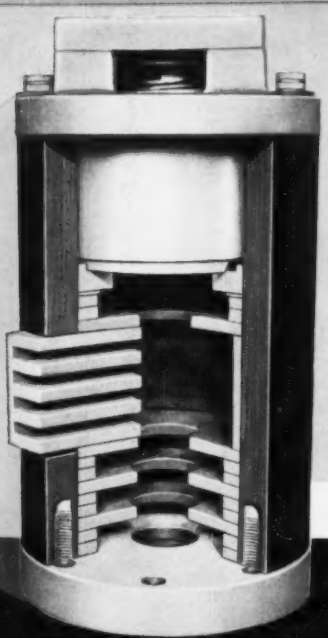
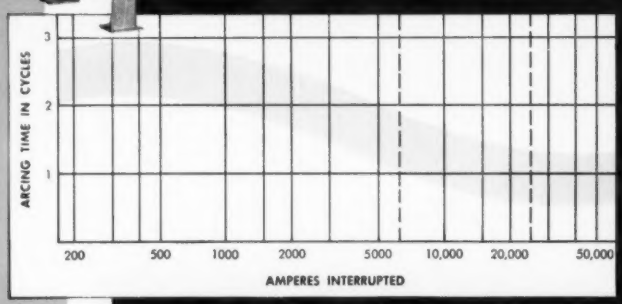
ALLIS-CHALMERS... Pacing Power Progress



Ratings: 23 kv to 46 kv, 500,000 through 1,500,000 kva.



Cross-blast principle of new LC interrupter cuts arcing time.



Graph shows short arcing times.

industry's newest interrupter

Here's new high-speed interrupting efficiency for Allis-Chalmers frame-mounted circuit breakers. New LC interrupter cuts arcing time. There's greater system protection, less oil contamination. Dielectric strength is extended, maintenance lowered.

More A-C breaker bonus benefits! You get mechanically trip-free operation. Highly successful *Pneu-Draulic* operator provides fast operation — ends moisture, rust, freezing. Hydraulic power-operated tank lifter cuts raising and lowering time by 80%.

For all the facts on these frame-mounted breakers, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

Pneu-Draulic is an Allis-Chalmers trademark.

A-1204-E

Electrical World

Vol. 152, No. 25 DECEMBER 21, 1959

Published for 85 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

In This Week's Issue

p 28

CURRENT EVENTS

New Program to Plug All-Electric Home

GE 'Residential Market Development Operation' will include trade and consumer advertising.....p 32

Utility Bolsters 25-Year Old Appliance Show

Role of San Diego G&E, support of dealers and distributors, and manufacturers' 1960 line help attroct 200,000....p 28

SYSTEM ENGINEERING

Dispatch 4,636 Mw Automatically

David W. Gilman, Commonwealth Edison Co

Dispatching system controls 92% of Commonwealth Edison's generating capacity—37 units, ten plants.....p 36

TRANSMISSION

Oahu 13-Mile Line More Economical at 138 Kv

George Jacroux, Hawaiian Electric Co

Hawaiian land costs prompt fewer circuits at higher voltage in new backbone system.....p 34

Special Report

p 57

Electric Utility Methods

Tailored especially for those men responsible for the construction, operation, and maintenance of electric utility systems, this special 52-page quarterly report brings down-to-earth experience stories

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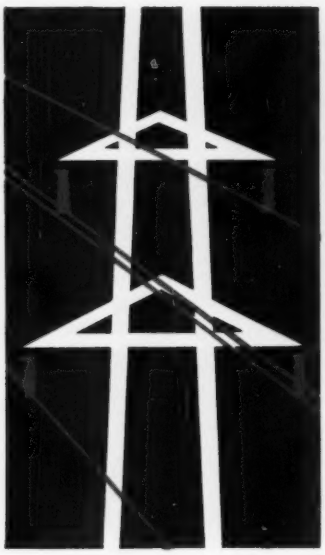
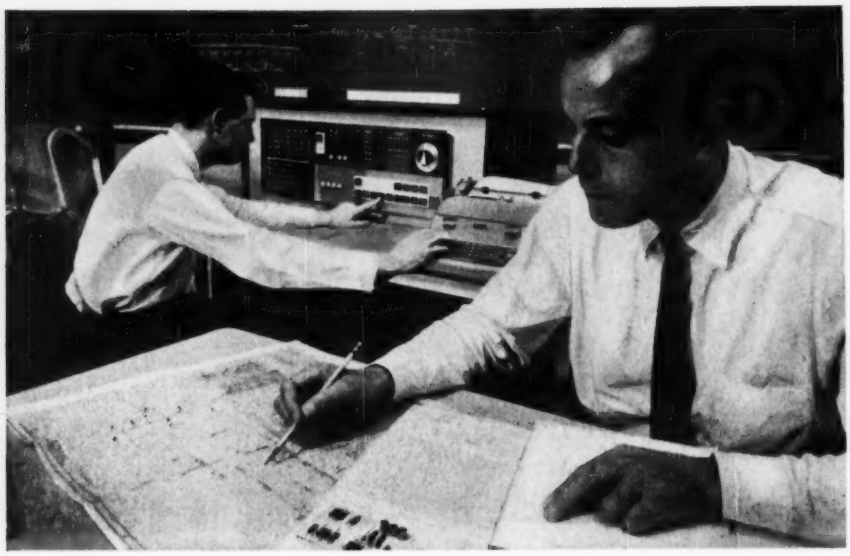
IBM 1620 *data processing system*

...the most powerful engineering computer in its low price class





In the Electric Utilities Industry the IBM 1620 solves problems like these:

- *systems planning and simulation*
- *load flow computation*
- *short circuit studies*
- *economic fuel purchase*

The new IBM 1620 is a desk-size engineering computer that offers you more computing ability per dollar than any system in its price class.

Transistorized throughout, the IBM 1620 has a 20,000-digit magnetic core memory with variable field length and immediate accessibility. Its input-output notation, on paper tape and console typewriter, is in convenient decimal arithmetic. It can perform more than 100,000 calculations a minute and is easily adapted to your engineering problems.

Easy to learn, easy to operate, easy to communicate with, the low-cost 1620 helps free your engineering talent for more creative work. And in keeping with our concept of Balanced Data Processing, the IBM 1620 is supported by extensive services. This includes a comprehensive library of mathematical routines and specific industry programs to permit you to put the 1620 to work without unnecessary delay.

Ask your IBM representative about the unique advantages of the IBM 1620. Like all IBM equipment, it may be purchased or leased.

IBM® *balanced data processing*

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LETTERS

A Dream and a Wish

To the Editor:

My dream is that the electrical industry will wake up, brush the cobwebs of the thirties away, set aside all the negative sales arguments, such as "costs too much to operate," bad load characteristics, etc.; accentuate the positive, talk the many benefits, and sell electric water heaters—any electric water heater—so that we can really enjoy Living Better Electrically.

F. M. Falge
Live Better Electrically Project
235 Montgomery St.
San Francisco 6, Calif.

A Most Illuminating Hobby

To the Readers:

From time to time we come across items in our conversation or in our reading that just don't fit anywhere in our magazine. Yet we know they would be of some topical interest to utility men.

We are thinking, for instance, of the feature article carried in a recent issue of the Sidney, Australia, Sunday Telegram telling of 18-year-old Finlayson Stewart, of Rose Bay, who collects light bulbs as a hobby. Young Stewart has more than 150 bulbs in his collection.

An Edison bulb of 1904 vintage is among the oldest in his collection which ranges from tiny bulbs for bronchoscopes to large bulbs for display lighting.

Stewart reports that he gets a lot of help from electrical companies and the Australian Electrical Contractors Association, who keep a lookout for items to pass on to his collection.

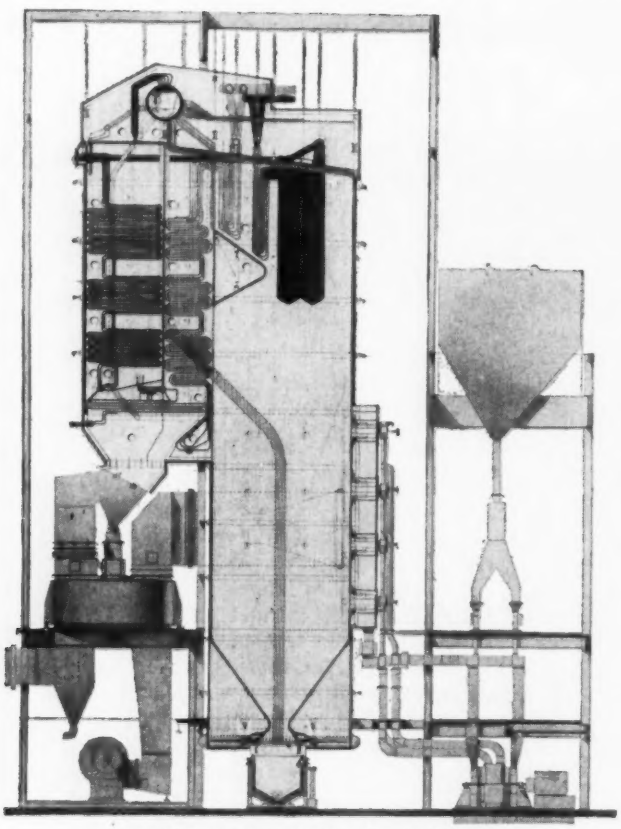
Last year we heard of another such hobby, but have had some doubts about passing along the word in print. A 12-year-old in Ho-Ho-Kus, N. J. won a prize for the most novel hobby when he displayed an extensive collection of electrical insulators ranging from pin-type to some of the smaller suspension type insulators. From photographs, it appeared that most of these were used insulators, and we got to thinking that this could become a most dangerous hobby—something akin to tiger hunting.

If you know of some unusual hobby that relates to the electric utility industry, perhaps you would drop us a note.

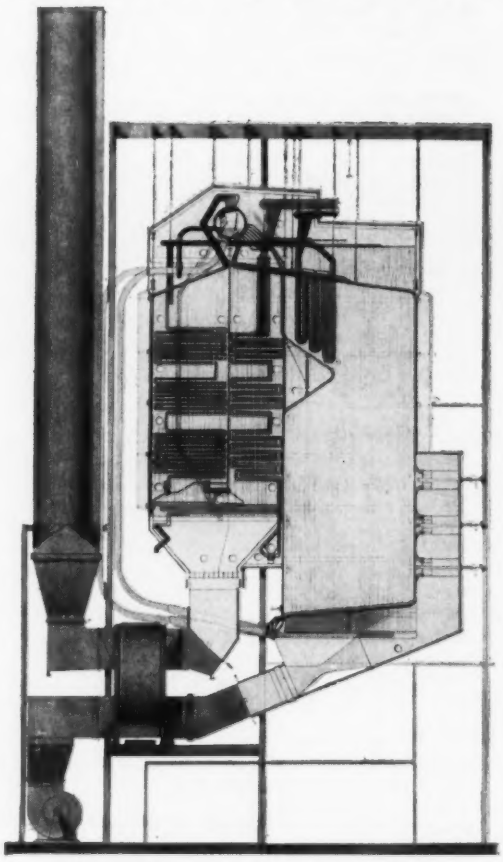
The Editors

COMING NEXT WEEK . . . A survey of the sixties in which Electrical World editors give a preview of problems and progress expected in the decade ahead.

Are You Planning To Burn COAL? OIL or GAS?



950,000 lbs./hr., 1950 psig, 1000/1000F;
Fired By Riley Pulverizers, Flare Type Burners



1,020,000 lbs./hr., 1925 psig, 1005/1005F;
Fired By Gas, Oil — Pressurized Furnace

Riley Custom Boiler Engineering, Know-How In Combustion Can Give You Top Performance Regardless Of The

Riley Boilers Equipped With Complete Riley Fuel Burning Systems

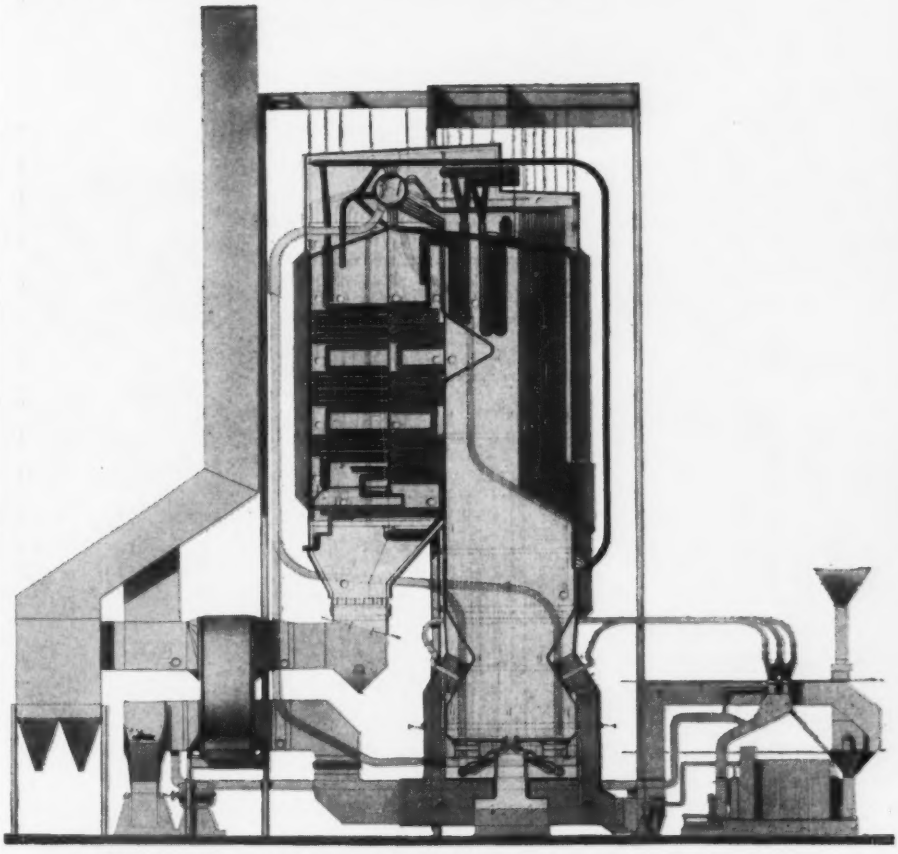
For pulverizing coal Riley offers two types of mills: the Riley Pulverizer and the Riley Ball Mill. These are used with either horizontal Riley Flare Type Gas/Oil/ Coal Burners, or with Riley multiple fuel Directional Flame Burners in Turbo Furnaces. A Riley Boiler installation complete with Riley fuel burning equipment assures Riley's undivided responsibility.

Turbo Furnace Boilers Designed Especially For Multiple Fuels

The Riley Turbo Furnace is ideally suited to firing multiple fuels. When firing coal furnace remains slag-free, flyash disposal is eliminated, carbon loss is negligible. Flame characteristics of gas, oil and coal are similar, simplifying steam temperature control. Available with reheat, non-reheat, with pressurized and non-pressurized furnaces in all capacities and pressures.

A Survey Of Your Plant by A Qualified Consulting Engineer Can Show You Ways To Make

or ALL THREE ?



1,600,000 lbs./hr., 2125 psig, 1005/1005F; Turbo Furnace with Riley Ball Mills; Pressurized Furnace. Fuels — Gas, Oil, Coal

SOME PUBLIC UTILITIES USING RILEY EQUIPMENT

Louisiana Power & Light Co. (3)
Texas Electric Service Co. (3)
Houston Lighting & Power Co. (13)
Dallas Power & Light Co. (3)
Kansas Gas & Electric Co.
Public Service Co. of Indiana, Inc. (12)
New Orleans Public Service, Inc. (3)
The Holyoke Water Power Co.
Columbus & Southern Ohio Elec. Co.
Central Illinois Light Co. (8)
Hartford Electric Light Co.
Central Power & Light Co.
Monongahela Power Company
Arkansas Power & Light Co.
Southwestern Gas & Electric Co.
Utah Power & Light Co. (3)
Florida Power Corporation (2)
Delaware Power & Light Co.
Minnesota Power & Light Co. (2)
Pacific Gas & Electric Co.
Iowa Public Service Co.
Commonwealth Edison Co.
Manila Electric Co.
Southern Nevada Power Co.
Interstate Power Co. (7)
Northern States Power Co.
Central Louisiana Elec. Co. (2)
Union Electric Co. of Ill. (2)
Northern Virginia Power Co.
Union Electric Co. of Mo. (7)
Pennsylvania Electric Co.
Iowa Electric Light & Power Co. (3)
Iowa-Illinois Gas & Electric Co. (7)
Montana-Dakota Utilities Co.
Mississippi Power Company
Philadelphia Electric Co. (4)
Central Ohio Light & Power Co. (6)
Gulf Power Co. (4)
Otter Tail Power Co. (5)
Public Service Elec. & Gas (N.J.) (7)
So. Carolina Elec. & Gas Co. (3)
Taiwan Power Company (2)

Numbers indicate Repeat Orders

Techniques, Selectivity Of Fuel Burning Equipment Nature of Fuel, Load, and Steam Conditions

Riley Provides Skilled Construction Engineering Services

Riley Stoker Corporation supplies complete construction services. Riley construction crews employ the latest in construction methods and techniques.

Experienced Service Engineers Assist In Maintaining Safe, Efficient Operation Of Your Boiler

Riley Service Engineers are trained for prompt and efficient servicing of all Riley installations. These experienced engineers work closely with your operators.

Riley Stoker Corporation, having successfully met the challenge imposed by the remarkable growth of the public utilities in the past decade is thoroughly prepared to meet the even greater challenges to come.

You'll Find A Riley Office In Each Of These Principle Cities:

Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Jacksonville, Kansas City, Los Angeles, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Salt Lake City, San Francisco, Seattle, St. Louis, St. Paul, Syracuse, Worcester.

RILEY STOKER CORPORATION, WORCESTER, MASS.

Surprising Savings In Your Power Costs

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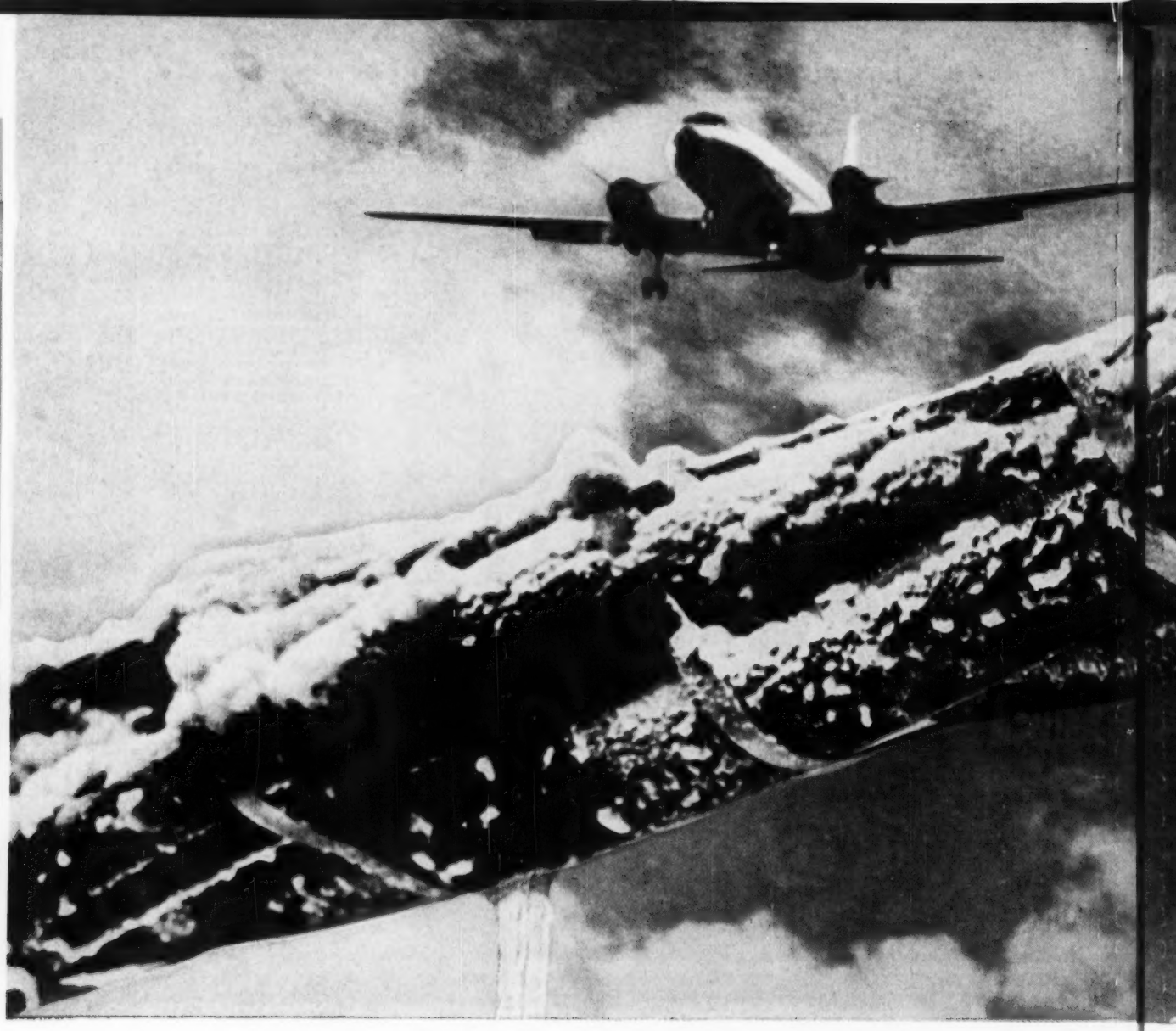
STEAM GENERATING & FUEL BURNING EQUIPMENT



Pile on the ice and snow!

Let it sleet. Let it snow. Let the wind blow.

This cable can weather the storm.

Rome's reverse-lay preassembled aerial power cable has a built-in, high-strength messenger for staunch support. Falling branches—even some trees—can be supported by the cable itself!

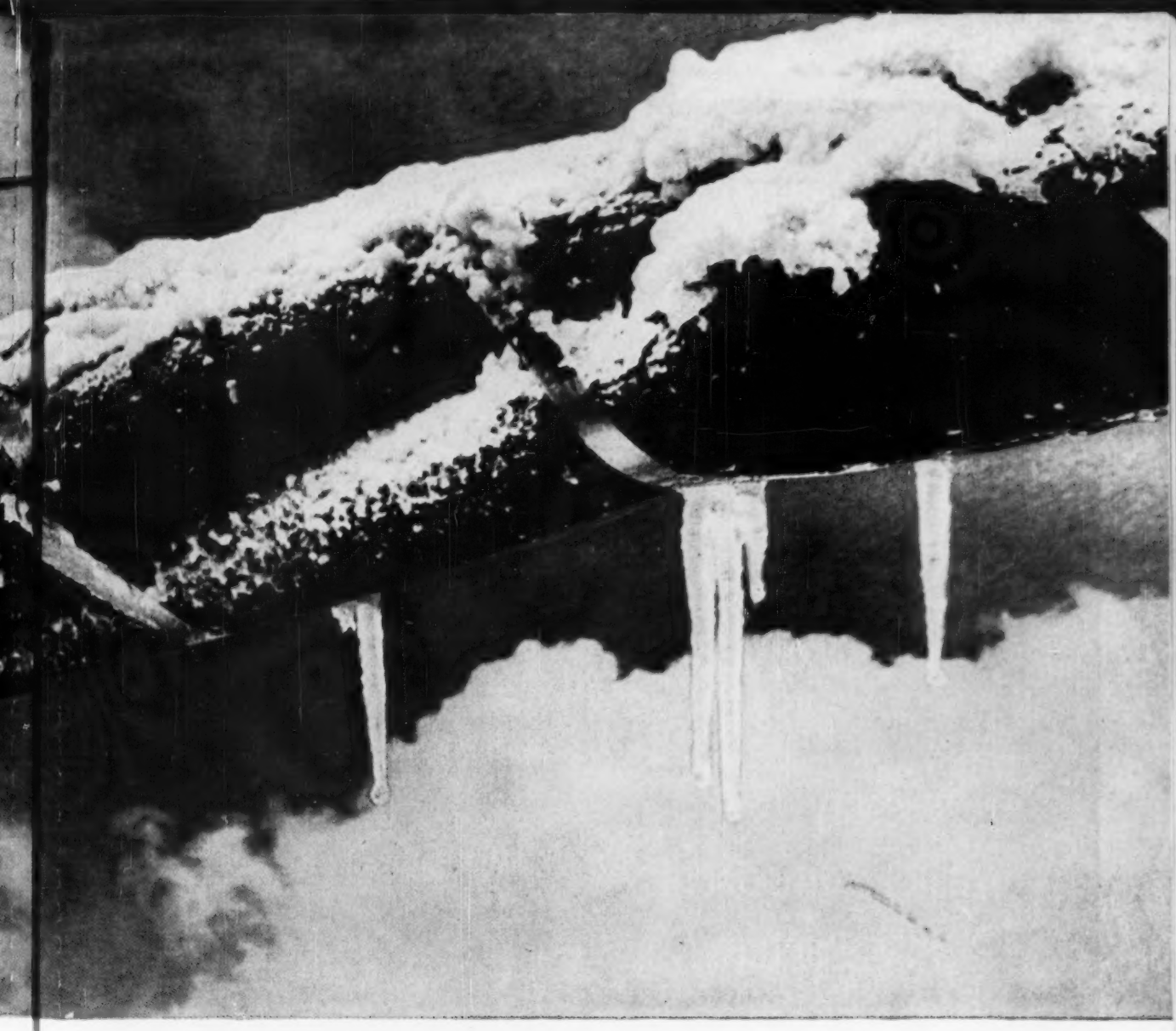
Fewer outages You can use this aerial cable to reduce the chance of outages during storms and high winds. Because it is fully insulated and jacketed for maximum resistance to moisture and tree abrasion, it prevents wet branches from shorting between phases. And it's *safer* for your line crews to handle . . . safer for the public too!

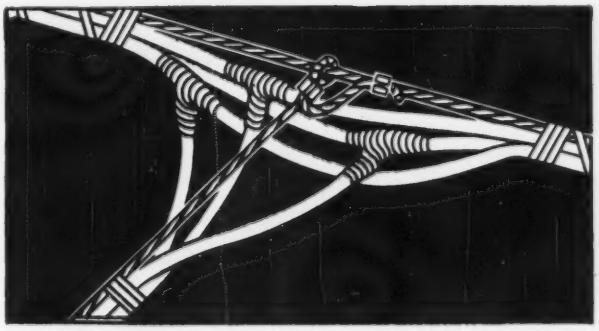
Routing more direct Because it is compact, you can route preassembled aerial cable more directly, with less right of way than is required for open-wire systems. You can run more circuits in less space. Less clearance is required, so you do less tree trimming—initially and periodically!

Wide range of constructions You can get Rome's preassembled aerial power cable in a wide range of constructions, rated up to 15 KV: Rozone (oil-base), Polyethylene, or Rozone A (butyl-base) insulation, Roprene (polychloroprene) or Roseal* (flame-retardant polyethylene) jacketing.

Get all the details from your Rome Cable salesman, or clip and mail the coupon today!

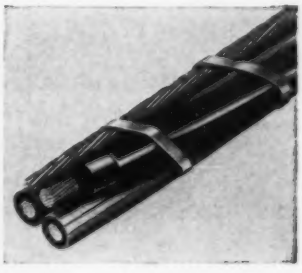
*Trade mark—Patented.





EASE OF TAPPING Long spans sometimes make mid-span tapping necessary. Rome's reverse-lay preassembled aerial cable construction—where the direction of lay of conductors is reversed at regular intervals along the line—permits easy mid-span tapping. The reversed portions provide sufficient slack for taps *anywhere* along the line! This eliminates the necessity of making taps at the pole ends only. Stress is carried entirely by the messenger. Conductors can be untwisted for tapping without cutting—even while the line is hot if conductors are unshielded (5 KV). Your linemen can use wire guards and rubber blankets for safety and make pole-end taps without use of a platform.

BETTER VOLTAGE REGULATION Because of its close geometric spacing as compared with open-wire circuits, aerial cable has a lower reactance. Voltage drop is about half as great as typical crossarm construction and, for a given voltage drop, power can be transmitted twice as far.



ROME CABLE
DIVISION OF **ALCOA**
Department 112, Rome, New York

☐ Please send me more information on the above.

Name .....
Title .....
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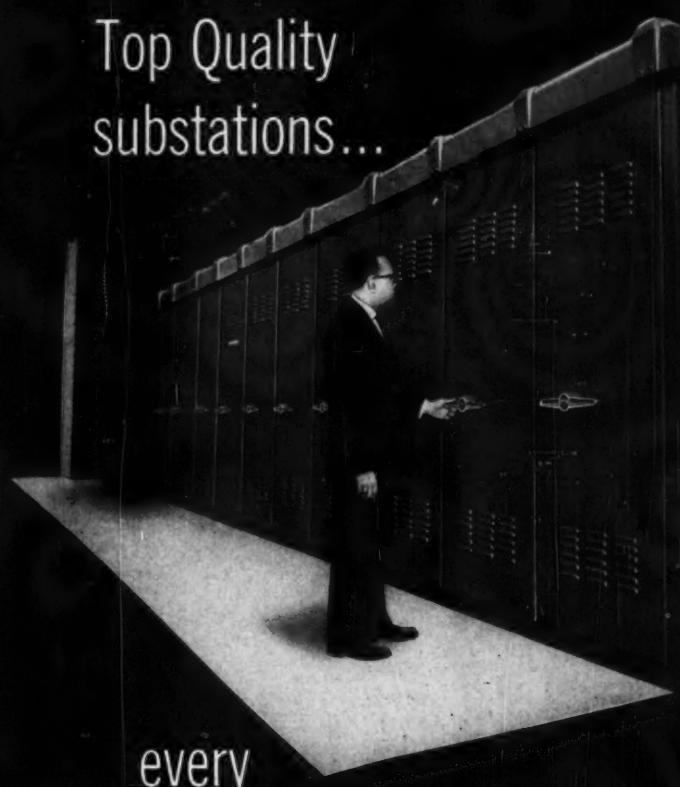
City ..... Zone ..... State .....

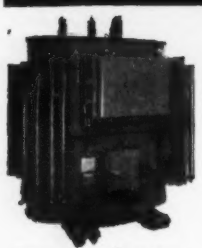
MEET THE MAN
WHO'S DEDICATED TO **YOUR** JOB
YOUR ROME CABLE SALESMAN

Top Quality substations...



15 kv outdoor primary unit substation styled by Raymond Loewy

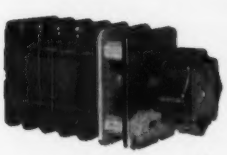
every major component manufactured by Federal Pacific



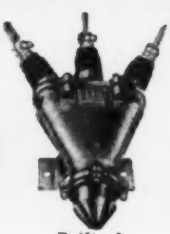
Power Transformers

Protective Relays

Indicating Instruments



Instrument Switches



Potheads

High Voltage Air Breakers

For single-source responsibility and reliable operation, look to Federal Pacific, one of only three companies to manufacture every major component of its primary unit substations. Federal Pacific's unit engineering, coordinated assembly, integrated quality control assure you built-in reliability and longer substation life. Federal Pacific Electric Company, General Offices: Newark 1, New Jersey.

FPE **FEDERAL PACIFIC ELECTRIC COMPANY**

The Best in Electrical Distribution and Control Equipment

The Electrical Week

FUTURE NEWS ▶ **Watch for Yankee A-plant to go critical sometime next October.**

LATE NEWS ▶ **Khrushchev calls for electrification of entire Soviet Union** within 20 years as part of USSR's long-range economic development.

California's Gov "Pat" Brown on power: "The West needs more cheap power. This means federal development of power and not the sell out of great water sites, such as Hells Canyon, to private utilities."

Around the States . . . Appalachian Power to install third 225-Mw unit at Carbo, Va., station . . . San Diego G&E forms employee information committee to carry out program on American way of life . . . Winthrop, Iowa, citizens vote to sell their system to Iowa EL&P; ditto for Bondurant, Iowa to Iowa P&L.

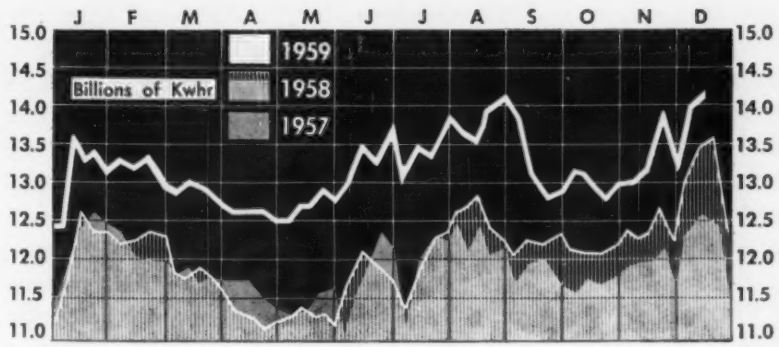
Arizona Power Authority asks FPC permission to enlarge pending licence application for Bridge Canyon-Marble Canyon hydro project from 780,000 kw to 820,000 kw. Other requested increases: Ultimate capacity from 1,390,000 kw to 1,470,000 kw; dam height from 450 to 480 ft; and cost from $289.5 million to $347.3 million.

TVA reports operating revenues of 99 municipals and 51 co-ops served by it totaled $164,584,000, up 5% from '58. Expenses totaled $40,855,000, up 6.5%, and net income was $23,729,000, down slightly from previous year. TVA-supplied systems sold about 16.4-billion kwhr during '59, up 6.5%. State and local taxes—or tax equivalents—paid by TVA were $5.9 million; distribution systems paid $8,860,000.

EEI announces change in Sales Promotion Award contest. A company may now enter a specific sales activity rather than its overall program.

Management changes . . . Arkansas P&L elects C. H. Walsh a vice president . . . T. R. Oakes becomes vp, treasurer and secretary of Square D Co.

WEEKLY POWER OUTPUT—Up 5.3% (Week ending Dec. 12), Kwhr 14,167,000,000



Per Cent Change From Previous Year

	Nov. 28	Dec. 5	Dec. 12
Total U. S.	+ 7.3	+ 6.8	+ 5.3
New Eng.	+ 4.1	+ 3.0	+ 2.9
Mid. Atlan.	+ 7.9	+ 4.9	+ 4.7
Cent. Ind.	+ 8.8	+ 6.7	+ 5.6
West Cent.	+ 6.5	+ 4.6	+ 1.7
Southeast	+ 7.9	+ 9.4	+ 4.1
South Cent.	+ 7.2	+ 8.7	+ 7.3
Rocky Mount.	+ 3.3	+ 2.0	+ 0.7
Pacific			
NW	+ 1.7	+ 4.6	+ 8.4
SW	+ 8.9	+10.6	+11.7

Seasonally Adjusted Index 261.4

Week Ago 261.1 Year Ago 247.6

Source: Edison Electric Institute

Preview of this Issue

EVENTS ▶ **San Diego's home appliance show,** rated one of the most successful in its 25-year history, gets a boost from San Diego G&E and local dealers and distributors. Floor sales alone hit $100,000 **(p 28)** . . . Protests follow proposal to up rates in Memphis by 20%. Unions, customers say city officials reneged on promise to maintain low rates after separation from TVA **(p 30)** . . . Whichever way U. S. Supreme Court rules on taking of Tuscarora land for Niagara project, the issue appears headed back to Congress **(p 31)** . . . Logical target for GE's "Residential Market Development Operation" is new-home builder. Six GE regional managers are key to new all-electric program **(p 32).**

ENGINEERING ▶ **Building 138-kv, instead of 44-kv, backbone transmission lines** solves land cost and right-of-way procurement difficulties for Hawaiian Electric in linking two Oahu substations 13 miles apart **(p 34)** . . . A new automatic dispatching system controls 92% of Commonwealth Edison's generating capacity (4,636 Mw), including 37 generators in ten stations **(p 36).**

SPECIAL REPORT ELECTRIC UTILITY METHODS ▶ **Coaxial cable in an unused duct line, with a microwave link,** affords Cleveland Electric Illuminating Co a carrier-current channel protecting two 132-kv pipe-type cable circuits **(p 75)** . . . An elec-

Politics and Public Power

A CHOICE OF POWER 'RACES'

Whatever political uses the prospective candidates in the coming Presidential election choose to make of the electric power "race" between the U. S. and the Soviet Union, they will have two very different sets of data on which to base their statements.

The first of these is the report issued earlier this year by Edison Electric Institute at its annual convention (EW, April 20, 1959, p83), and supplemented to some extent by the recent appraisal of the Soviet seven-year power program by Philip Sporn. The second set of data will be that contained in a forthcoming report to be issued by the recently returned government - sponsored group headed by Sen Frank Moss (D—Utah), a sampling of which was given Electrical World by Clyde Ellis of National Rural Electric Cooperative Association in last week's issue.

While the principal differences of these two reports will be in their conclusions concerning the relative electric power postures of the U. S. and the U. S. S. R., some differences on detailed statements have already cropped up which the candidates may be able to use as campaign ammunition.

For example, a candidate favoring a EHV federal "backbone" transmission grid could cite a recent Ellis statement (not contained in EW interview) that "400,000-volt transmission lines are common . . . and that the Russians are currently stepping this up to 500,000 volts on a few existing lines." His opponent might counter (based on a recent EEI statement) that actually there are only two 400-kv lines in the Soviet Union.

In speaking to the same point, our hypothetical pro-backbone-grid candidate might again cite Mr Ellis' statement that the Soviet

tronic surveying technique saves time and money in laying out Potomac Edison transmission line (p 82) . . . This section also includes New Equipment and Manufacturers Literature (p 98).

PROCUREMENT & PRODUCTS ▶ **Electric utility buying will be up in 1960,** EW's annual construction budget survey indicates . . . Commodity prices for industry generally have remained pretty steady (p 46) . . . Babcock and Wilcox Co readies 60-ton heat exchanger for Con Ed Indian Point A-plant . . . Federal Pacific launches traveling exhibit of its equipment . . . Westinghouse gets order from Public Service E&G for 325-Mw turbine generator (p 48).

BUSINESS OUTLOOK ▶ **There's a boom shaping up for 1960,** according to McGraw-Hill's Dept of Economics. The steel strike, which kept 1959 from being a boom year, has pushed so much business activity over into next year that 1960 can hardly miss. Early in the year, the economy should climb back on the trend line of post-war growth, which it has been trailing since the 1958 recession (p 111).

SELLING ▶ **Don't neglect the commercial and industrial markets,** conferees at Southeastern Electric Exchange Sales Conference hear (p 52).

power system is "hooked up" from power source to power source, while the candidate speaking against the grid would use EEI's statement to point out that "In actuality, Russia has 52 separate power systems, with three separate systems in European Russia. There are some plans for interconnection, but no time schedule has been set." He might add that the U. S. with an area only about a third that of Russia, has almost four times as many transmission-miles.

The differences with respect to power capacity are even more dramatic.

Water Resources Associated says that on the basis of present construction rates and allocations, the U. S. S. R. will have more power available for heavy industry than we will by 1965. And Mr. Michael Straus, a member of the government sponsored team issuing the report, recently told the Electric Consumers Information Committee that "Within 15 years the Soviet Union would be able to generate as much power as the U. S."

Not so, says EEI. The Institute goes on to say that by the end of 1958, Russia had 53 million kw and the U. S. 160 million kw. In 1959, we will have added 14 million kw, while the Russians will have added 6 million. By 1965, Russia expects to have 110-112 million kw compared to a forecast for the U. S. of 245 million kw. Our lead, then, in '65 will be 130 million kw—more than the present 115 million kw. EEI further maintains that our lead will be held even when taking into account the U. S. S. R.'s heavy kw allocation for industry.

It will be interesting to see what hay, if any, the candidates make of these issues. And if they don't, it's a sure bet that the supporters of the two positions will.

Nuclear Notes

Reloading of fuel elements at Dresden was resumed Dec. 10. Scheduled to begin Dec. 3 it was delayed by tests that took longer than planned. New seals have replaced broken ones (EW, Dec. 7, p 46) that resulted in control rod jamming and shut-down Nov. 6. Testing of zircalloy fuel element tubes is continuing. It is to be completed Dec. 23, except for testing of spares.

New York State utilities deny recent newspaper reports that they are planning to back a $70 million 350-Mw nuclear power plant to demonstrate the commercial feasibility of atomic power. The rumor was associated with recommendations of the N.Y. State Office of Atomic Development to Gov. Rockefeller (EW Dec. 14, p 44) that another reactor plant be built in the State to complement the one being built at Indian Point by Con Edison. It was indicated that the State might share R&D costs with private utilities.

Niagara Mohawk Power has established a nuclear engineering section in its engineering department. It will make studies to determine the best type of atomic power plant to build when it becomes economically feasible. Heading the group is Howard D. Philipp, formerly Atomic Power Development Associates.

No atomic reactor will be built at Elk River unless AEC provides health and safety information sought by the State of Minnesota, and meets the State health requirements, Gov Orville L. Freeman has stated. The nuclear boiling water plant is under construction at the Elk River Rural Electric Power Cooperative, 30 miles north of St Paul and Minneapolis. The Governor's request, in effect, would require a federal agency to write state law into its contract. This, an AEC attorney points out, raises a complex constitutional question on the pre-eminence of federal vs state law.

The Netherlands has decided against building a nuclear power plant, contending that such a project is not economically feasible at present. According to Dutch estimates a 150-Mw nuclear installation with an annual output of one billion kwhr would cost about $2.6 million more a year to operate than a conventional plant.

First of four 60-ton heat exchangers for Con Edison's Indian Point nuclear generating station arrived on the Buchanan, N. Y., site in early December, from the Babcock & Wilcox boiler division works at Barberton, Ohio. The other three will be delivered in the next four months. (See also p 48)

Plans to spend $2 million for a new laboratory building, headquarters building, administration building, and a new computer for its atomic power equipment department, has been announced by General Electric Co, to keep pace with business growth expected in 1960.

They roll with the punch!

It's simple to say "I'm all done" when you have designed a bushing for normal service. This is not true. One of the toughest chapters in a bushing's life is getting it to its work. It travels on trucks or freight cars. It may have a heavy 'ruptor mechanism attached to its lower end. It may be loaded and unloaded several times by freight handlers who don't exactly give it "kid glove" treatment. It gets still more handling on the construction site.

Powerful endwise compression, developed by *coil* springs -- an original O-B development -- keeps bushings tight and perfectly aligned against any lateral movement in spite of severe accidental shocks. In the extreme case, the assembly can give and recover because coil springs permit slight movement under constant sealing pressure without damage to themselves or to other parts. Briefly, O-B bushings can "roll with the punch."

This gets O-B bushings onto the job in the same condition they left the factory -- a mighty important thing for bushing users to think about -- especially in the case of O-B where *no better bushing* comes out of *any factory*.

It is easy to avail yourself of this extra advantage. Just express your bushing choice when you purchase new station apparatus. Say, "O-B equipped." Name it, and you can have it!

OHIO BRASS COMPANY, MANSFIELD, OHIO

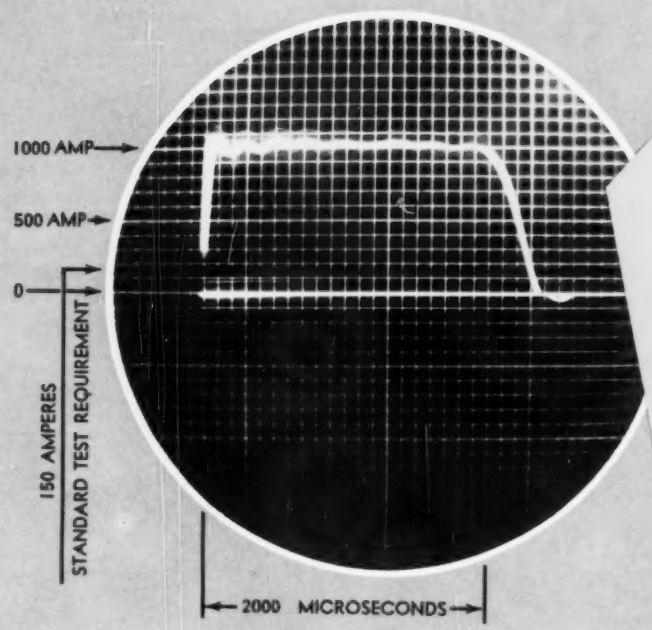
Ohio Brass

HOLAN

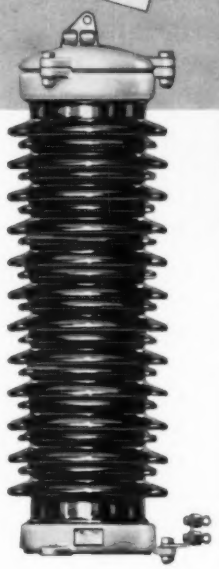
PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

4923-H1

"Beyond the call of duty"



Thorex arresters exceed by many times standard durability requirements



Durability is one of the biggest features of Thorex Dynagap lightning arresters -- a capacity to withstand the heavy, and sometimes unpredictable demands imposed by modern transmission systems.

This characteristic can be measured. ASA Station Class Durability Standards require an arrester to withstand a series of 20 discharges of 150 amperes, having a duration of 2,000 microseconds. These discharges are spaced over a time period of 75 minutes which permits valve block cooling between applications.

Compare the standard with the oscillogram shown here. Station Class Thorex arresters are tested, not at 150 amperes, *but at 1,000 amperes or more!* The O-B impulse generator is set on fast automatic cycling and applies a discharge every 20 seconds, allowing no thermal relief period.

Nearly seven times the required standard current is applied in less than one-tenth the allowable period of time. Because of the cumulative effects of this severe test procedure, it would be difficult to evaluate Thorex performance against standard requirements.

This is the kind of durability you get in Thorex arresters. Durability "far beyond the call of duty." And this is another reason why your stations should be Thorex-equipped.

OHIO BRASS CO., MANSFIELD, OHIO

Ohio Brass (B) HOLAN

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BUSHINGS · HOLAN TRUCK MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

4928-H2

Ingenious pothead design

Here's the principle - greatly simplified - of O-B's Stress Cone
O-B develops new technique to obtain true shape of vital stress cone

The electrical stress cone of a high voltage pothead -- one of its most vital components - - has depended, in the past, on somewhat "primitive" methods. In O-B's new capacitor graded pothead, this important part has at last yielded to adroit design.

Permanently attached to the paper buildup is a narrow foil strip, set at a slight angle. Wrapping of this buildup generates a stress cone having a smoothly-formed helical shape of predetermined logarithmic conformation. Furthermore, this highly refined version of a stress cone is produced under completely controlled conditions, as a by-product of installing the factory-made buildup.

Many other parts show equally ingenious design. These new O-B potheads are applicable to any type of cable, presently in the range of 115 to 230 kv.

If you contemplate the use of underground cable, be sure to investigate this new O-B terminal equipment. Discuss it with your O-B representative, or write us direct.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass HOLAN

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4930-H2

It's easy to be safe

It sounds foolish to ask if you would build a major transmission line *and not even know the kind of insulators that are used.*

That line terminates at a station. Insulation reliability is just as important here.

This station contains many switches -- purchased complete with their insulation. *Do you know what kind of insulators?* Isn't it just plain logical that you should? Can an insulator be good enough for a station and still not good enough to trust on a line?

Switchgear manufacturers gladly perform the service of complying with your insulator preference. There is no penalty in cost or trouble. Just state your choice. It's as easy as saying "O-B". Name it and you can have it!

OHIO BRASS COMPANY, MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Ohio Brass

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4928-

FROM EVERY POINT OF VIEW

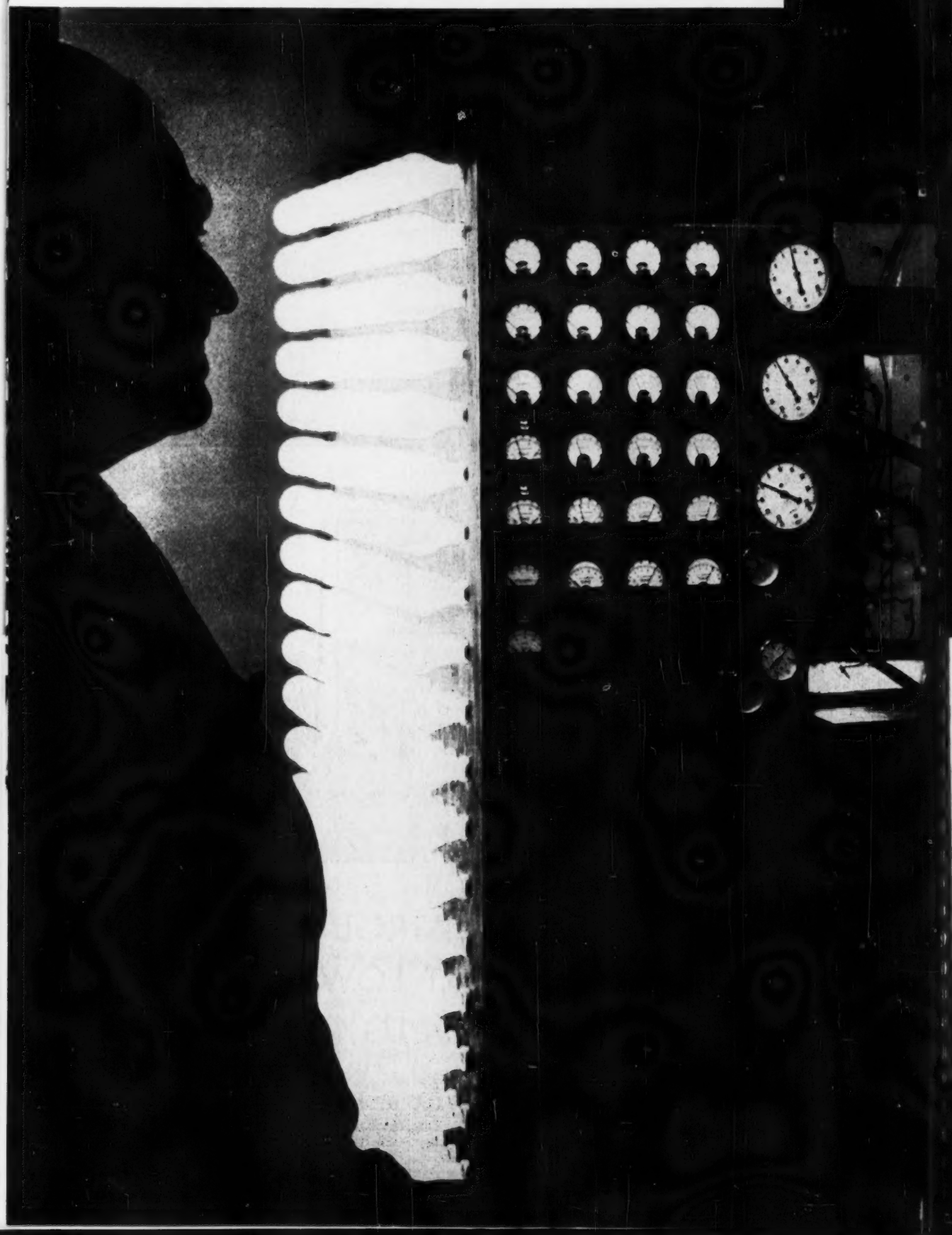
MARK I LUMATROL, *Tubeless*
(Actual Size)
NEMA MOUNTING

THE NEW MARK I LUMATROL GUARANTEES HIGHEST RELIABILITY AT LOWEST COST IN AUTOMATIC STREET LIGHT CONTROL

Write for complete specifications

MICRO BALANCING, INC., HERRICKS ROAD, GARDEN CITY PARK, L.I., NEW YORK

In Canada: J. R. Kearney Corp., Box 270, Guelph, Ontario



View of Avco-Everett laboratory's experimental magnetohydrodynamic (MHD) power generator as it successfully lights a bank of 228 50-watt bulbs for the first time. The device already has produced more than 10,000-watt output and represents a first step in application of the MHD theory to generation of commercial electric power.

Ten power companies join Avco in research program to develop new electric power generation system

Ten leading power companies have joined with AVCO in a research and development project which could revolutionize the nation's electrical power industry and effect a 25 per cent increase in operating efficiency.

Key to the project is the elimination of the turbine generator in power generation cycles.

The new power system is based on the scientific principle of magnetohydrodynamics (MHD). A small experimental laboratory device, utilizing the MHD principle to generate electric power, is currently operating at the Avco-Everett Research Laboratory.

The utility group joining with AVCO includes Appalachian Power Company, Central Illinois Light Company, Dayton Power and Light Company, Illinois Power Company, Indiana & Michigan Electric Company, Indianapolis Power and Light Company, Kansas City Power & Light Company, Louisville Gas and Electric Company, Ohio Power Company, and Union Electric Company.

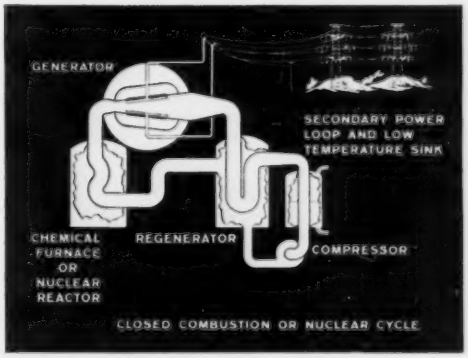
The 10-company utility group will be represented by American Electric Power Service Corporation, a subsidiary of American Electric Power Company, as agent in carrying out the joint venture with AVCO.

WHAT IS MHD?

Magnetohydrodynamics—MHD—is the study of the interactions between a magnetic field and a superheated, ionized gas. Magnetohydrodynamic studies have long been conducted by personnel of Avco-Everett Research Laboratory. AVCO scientists first began work in the MHD field in connection with space propulsion and successful re-entry from outer space. As a result of these studies came the first indications that it might be possible to produce electricity for utility application.

At sufficiently high temperatures, gases become ionized; that is, the atoms of the gas tend to lose one or more of the electrons which circle the atomic nucleus. When electrons are lost, the atom becomes a positively charged ion.

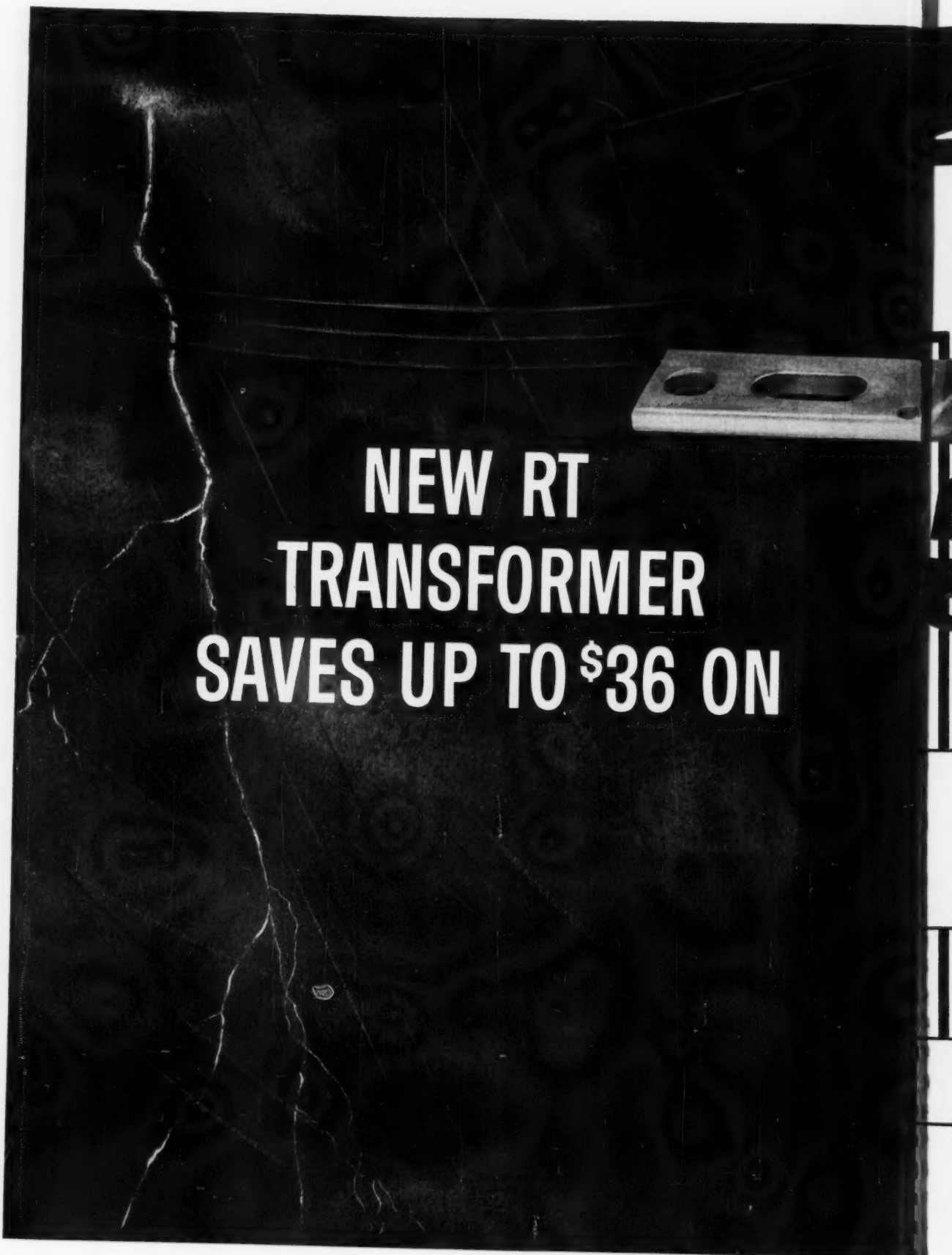
An ionized gas will conduct electricity. An ionized gas passing through a magnetic field will generate electricity. This is because the gas is an electrical conductor and acts like the armature which passes through a magnetic field to generate electricity in a conventional power plant. In a conventional electric plant a solid coil of wire, the armature, passes through a magnetic field to produce electricity. In the MHD generator a superheated, ionized gas is substituted for the armature, eliminating much of the heavy and costly equipment of a conventional system.

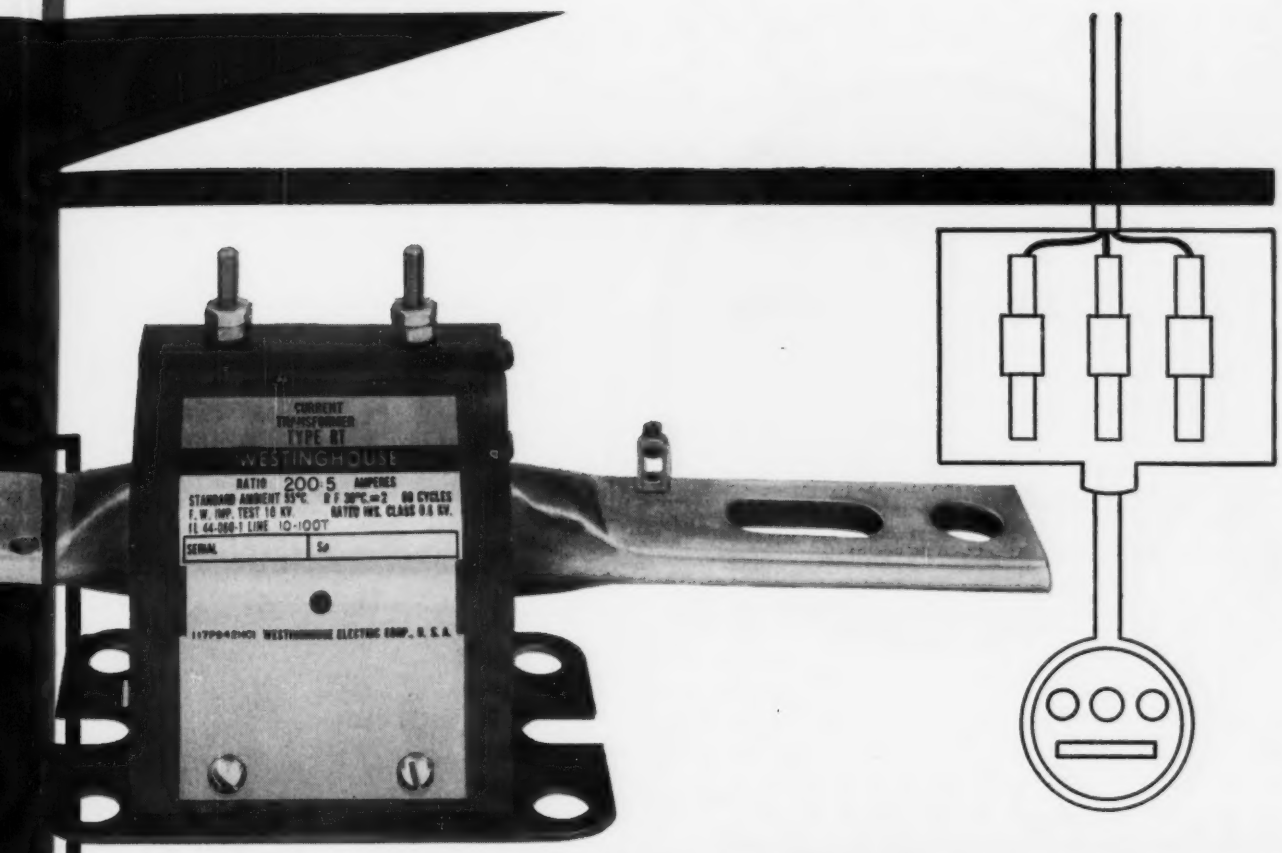


System chart shows magnetohydrodynamic commercial power generation cycle. Chemical furnace or nuclear reactor (lower left) heats and ionizes working gas, which then flows through magnetic field in the MHD generator. Direct current is tapped off the ionized gas by means of electrodes in the generator. Gas is then cooled in regenerator and heat sink, compressed and preheated in regenerator prior to re-entering furnace for heating and ionization.

AVCO CORPORATION / 750 THIRD AVENUE, NEW YORK 17, N. Y.

AVCO


NEW RT
TRANSFORMER
SAVES UP TO $36 ON



EACH INDOOR INSTALLATION!

Why pay for outdoor protection for an indoor installation when you can save over one-third with the new Westinghouse L-V current transformers designed for "indoor" use only! If you've been paying premium prices for outdoor-type, low-voltage current transformers and then mounting them indoors, or outdoors in a weatherproof box, here's important news. Our new RT transformers are specifically designed for installations where the more expensive molded weatherproof transformers actually are not required. This *exclusive* Westinghouse design was created to fill the need felt by many customers for a dependable, high-performance current transformer without the "extras" furnished in present molded indoor-outdoor units. As the specification sheet below shows, we've offered this economy without any compromise in ASA standards. And the net saving per unit is just about $12.

Let's take a look at performance specifications—Westinghouse Type RT Low-Voltage Transformer

1. 600-volt class, available in current ratings of 200/5 and 400/5 amperes.
2. Meets standard ASA 0.3 accuracy class.
3. Rating factor of 2.0.
4. Available with high or low base.
5. Stud-type connector.

Your Westinghouse sales engineer can show you how the RT can make substantial savings for you when mounted in an enclosure.

J-70916

BONUS VALUES BEYOND THE SPECIFICATION

YOU CAN BE SURE...IF IT'S Westinghouse

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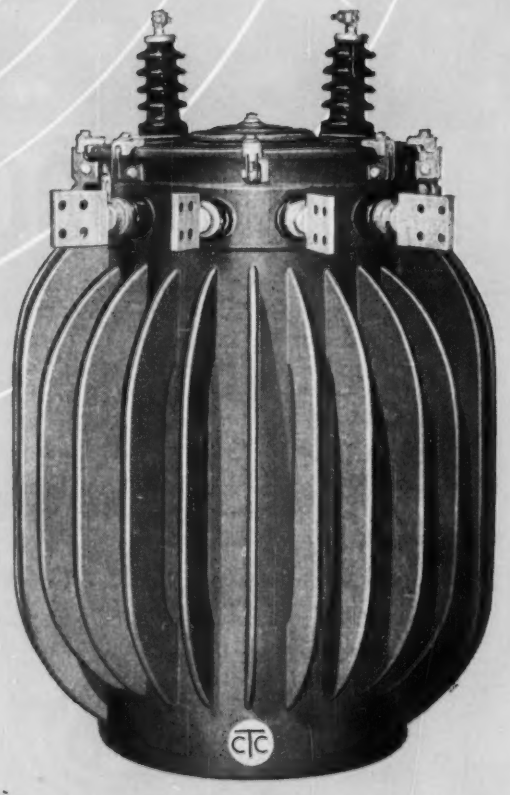
. . . means SERVICE!

It's EASY to do business with Central! As manufacturers of only ONE product (transformers of superior quality), we are able to follow through more efficiently in all matters related to customer service.

We carry substantial stocks of standard distribution transformers in our Pine Bluff warehouse and in other warehouses located at strategic points throughout the nation.

Central sales representatives, with offices in principal cities, are on call at all times to give personal attention to customer needs.

Fast, economical delivery of Central transformers, by truck or rail, is assured by experienced transportation expediters.



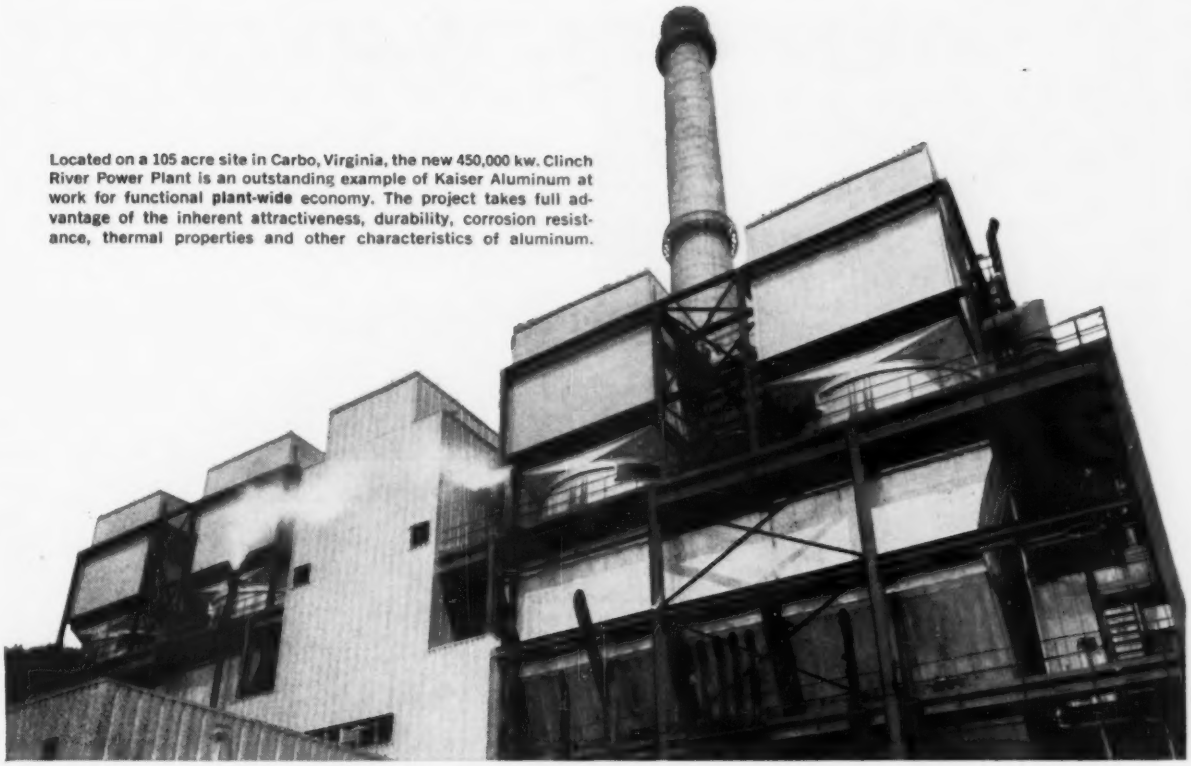
CENTRAL

Sales Offices in Principal Cities

Transformer Corporation

Telephone JEfferson 4-5332

PINE BLUFF, ARKANSAS



Located on a 105 acre site in Carbo, Virginia, the new 450,000 kw. Clinch River Power Plant is an outstanding example of Kaiser Aluminum at work for functional plant-wide economy. The project takes full advantage of the inherent attractiveness, durability, corrosion resistance, thermal properties and other characteristics of aluminum.

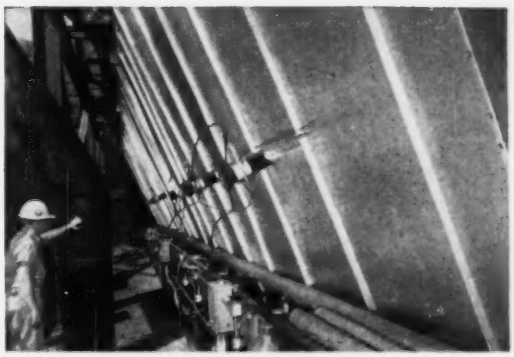
NEW CLINCH RIVER POWER PLANT... PLANNED SAVINGS WITH ALUMINUM

Big savings on upkeep—that's why the Appalachian Power Company chose Kaiser Aluminum ribbed industrial siding to sheath the two giant outdoor boilers at its new Clinch River plant.

Unlike other protective coverings, aluminum will not rust, crack or deteriorate in corrosive atmospheres. Thus substantial long-term savings on maintenance can be expected. In addition, aluminum is non-sparking and highly reflective. And because it is so light in weight and easy to assemble, application is faster and costs less.

All told, 200,000 square feet of aluminum were used to cover Clinch River's two giant boilers.

Other cost-saving applications of Kaiser Aluminum at Clinch River include jacketing on breeching, piping, fly ash collection hoppers—plus siding for buildings, louvers, doors, windows and ornamental trim.



KAISER ALUMINUM *

THE BRIGHT STAR OF METALS

*T. M. Kaiser Aluminum & Chemical Corp.

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ALLIS-CHALMERS... Pacing Power Progress

Proof—
Allis-Chalmers distribution transformers mean more revenue

COMPARISON OF EXCITING CURRENT VALUES

5 kv and below (Test data from 2400-volt units)			Above 5 kv (Test data from 7200-volt units)		
Kva	Previously published	New guaranteed value	Kva	Previously published	New guaranteed value
5	3.2	3.0	5	3.5	3.0
10	2.7	1.5	10	3.0	1.5
15	2.1	1.5	15	2.6	1.5
25	1.7	1.5	25	2.0	1.5
37½	1.6	1.0	37½	1.8	1.5
50	1.5	1.0	50	1.6	1.5
75	1.5	1.0	75	1.5	1.0
100	1.5	1.0	100	1.5	1.0
167	1.4	1.0	167	1.5	1.0

EXCITING current cut as much as 60%

Reduction of exciting currents... by as much as 60%... means Allis-Chalmers distribution transformers give you greater system efficiencies four ways:

1. Generating capacity requirements are cut. Only minimum amounts of nonrevenue-producing exciting current are needed.
2. Lower exciting currents help reduce copper loss on transmission lines.
3. Your system carries a higher amount of revenue-producing power.
4. Reduces need for system power-factor corrective equipment.

The new Allis-Chalmers guaranteed values are available to you in all A-C distribution transformers up to 167 kva . . . in all voltage classes.

Get all the details from your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-1202-E

Season's Greetings

In an ever-changing world the changeless spirit of Christmas is something we can cherish always.

It is an occasion when we renew our thanks for the warmth of home and family and friends. It is a season for each of us to renew our dedication to the Christian principles that give us hope and courage, and guide us with faith and certainty toward a brighter future.

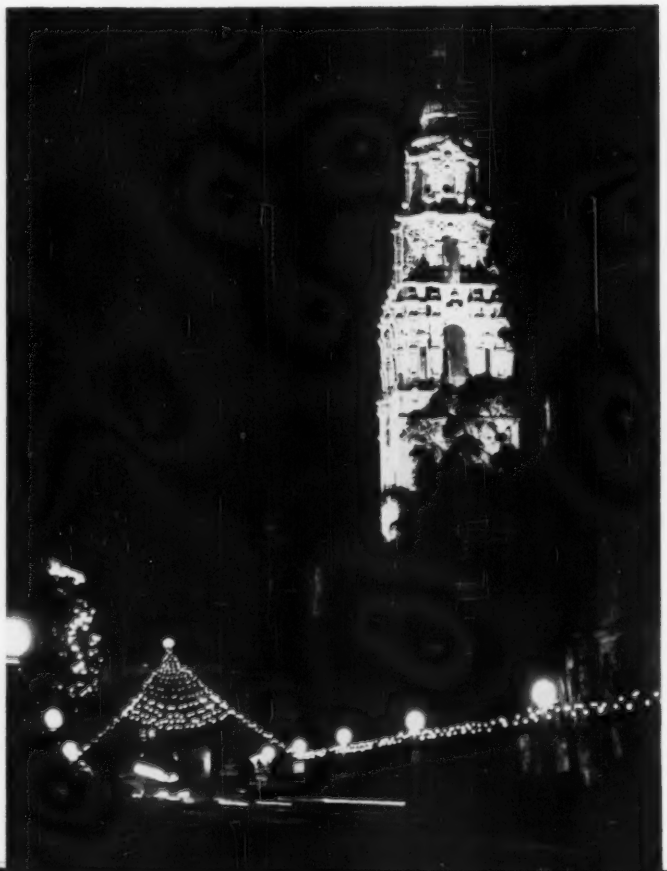
As we look forward confidently to another year, we send to each of you warmest Christmas greetings and best wishes for success and happiness in the years to come.

Our appreciation to Chairman D. E. Ackers and President Balfour S. Jeffrey of Kansas Power & Light Co for permitting us to reproduce this Christmas message

APPLIANCE SALES INCREASED as result of the admission-free exhibits, which drew 200,000 persons

EXCITEMENT, IMPACT, NOVELTY of show was aided by display of some 100 brand-name items, most of them 1960

San Diego G&E



At the turn of the century utilities in many sections of the U. S. sponsored electrical shows—"expositions" was the popular term then—for prospective users of the glad irons, light bulbs, the occasional ranges, and other devices that intrepid manufacturers hoped would capture the public's fancy. The practice waned, perhaps as word-of-mouth judgments of the new electrical appliances became the dominant purchasing influence.

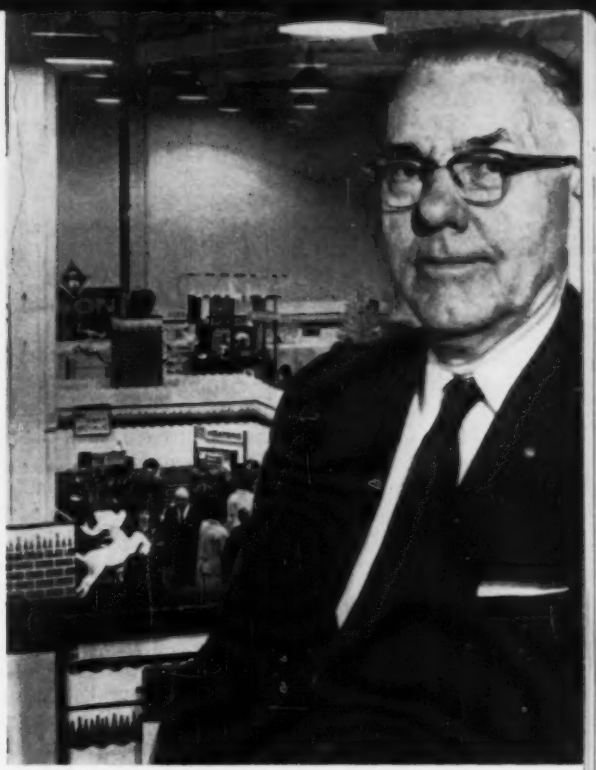
This buying criterion, shaped to some degree by advertising, still predominates. Nonetheless, a few utilities are taking part in expositions providing excitement, impact and novelty for a public interested in what's new and different in electrical appliances.

One of these, San Diego Gas & Electric Co, plays an important role in the annual Electrical & Home Appliance Show, which ended a six-day run Dec. 2 after about 200,000 spectators visited the electric building in Balboa Park. Officials of the sponsoring Bureau of Home Appliances of San Diego County, said the show was one of the most successful in its 25-year history.

The bureau puts the show on itself without direct aid from the company. Bureau Manager Clark Chamberlin, however, admits the show's success is dependent solely

◀ **TRADITIONAL SEASON OPENER**—lighting of Christmas tree lane—coincided with start of six-day show

models; interest was boosted by $30,000 worth of advertising, $6,000 more was spent by San Diego G&E to publicize event



MAN IN CHARGE of expositions is Clark Chamberlin, the Bureau of Home Appliances manager

Bolsters 25-Year-Old Appliance Show

on the reactions and participation of San Diego G&E, and the appliance dealers and distributors. The bureau's advertising budget is financed by the utility. The total this year was $6,000, and was spent on ads and publicity before the show's Nov. 27 opening when Mayor Charles C. Dail switched on the lights for a Christmas tree lane. In addition, dealers and distributors put over $30,000 worth of ads in 12-page show sections in two of the city's papers.

Chamberlain said the utility's officials continue to support the show, and a similar spring endeavor, because they believe the free exhibits are a major stimulus in selling appliances and allied equipment. San Diego G&E's commercial manager, Walter Chapman, and sales manager, Ed Meise, are directors on the bureau's board. Meise also is a show committee member.

Dealer reaction was exceptionally good this year, Chamberlain said. Their exhibits upped sales of major items and displayers of new devices were encouraged by spectator interest. The bureau has no way to survey the number of sales resulting from the winter and spring shows, but they "have more influence on appliance buying than everything else we do put together," he stated. About $100,000 worth of appliances were sold off the floor of this month's show. This, however, represents "only an infintesimal amount of total sales resulting from the show," said Chamberlain. Some of the dealers, he added, finance each year's exhibit with floor sales.

KITCHEN DEVICES interest part of crowd; others saw next year's washers, ranges, dryers, refrigerators, table items

Storm Brews on 20% Memphis Rate Increase

Protests on amount and method of determining it to be aired at hearing; critics lash Colorado PS and Arkansas P&L

Citizens of Memphis, Tenn., are discovering that the costs of being in the power business for themselves will require rates higher than those charged by the Tennessee Valley Authority. The Memphis city commission authorized a 20% increase earlier this month.

The city commission's approval of the increase, plus the after-the-fact determination of which customer classifications will produce it, raised a storm of protest. Leaders of labor unions and other residents of the city charged that city officials and the Memphis Light, Gas & Water Division reneged on promises of maintaining stable rates comparable to those charged by TVA.

The change in rate schedules is awaiting completion of a study by Black & Veatch, a Kansas City, Mo., firm. Residential customers probably would pay the biggest share of the increase, observers said, while the higher industrial schedule would be designed to permit continued expansion of existing industry and the attraction of new industrial plants.

A public hearing on the increase has been set for tomorrow. The new rate schedules will be discussed at this time.

Three Factors Cause Hike

The division cites these reasons for the hike: **1.** 1959 electric revenue will be $26 million while expectations, based on a 1956 feasibility report, were for $34.7 million. **2.** Expected interest rate on money for the new Thomas Allen steam plant was 3%, but the actual rate was 4.4%, which put total interest $2 million above estimates. **3.** A $4-million-per-year depreciation fund will have to be diverted to cover costs of borrowing.

This all means, the division says, that it is falling about $14.7 million short of expected funds.

Memphis residents now pay $6.90 for 500 kwhr and $5 for 250 kwhr.

In a letter to the editors of the *Commercial Appeal*, one resident said the move was "undercover larceny" and called for a court test of the "secret session without the proper procedure." His and other complaints presumably will be aired in the Dec. 22 hearing.

In an editorial backing the increase, the *Commercial Appeal* injected this bit of criticism: "We admire efficiency wherever displayed and the Light, Gas & Water Division is noted for just that. However, if all agencies of municipal government were operated on a scale comparable with that which has become standard with the utilities division, the cost of local government would be much higher than it is."

The editorial said it was a "seeming inevitability" that increased labor and coal costs would bring higher rates for TVA as well as Memphis, "because of the character of the self-financing provisions authorized at the last session of Congress."

In other rate developments, Public Service Co of Colorado has encountered opposition from the state Municipal League which has charged that the 10% increase sought by the company is excessive. The proposed hike of $10 million is too high "when they (PSCo) can afford to pay $13 million in dividends to stockholders," a league spokesman said, following testimony before the Public Utilities Commission.

The company seeks a 6.75% rate of return. In 1954 a 6% return was authorized. W. D. Virtue, the company's executive vice president and treasurer, told the PUC that this has dropped from 5.84% in 1955 to 5.05% for the first half of 1959.

AP&L's Co-op Rate Criticized

In Arkansas, Lewis M. Robinson, chairman of the state Public Service Commission, recently unleashed an attack on the practice of private power companies selling electricity to cooperatives at rates below what it costs to generate the energy.

Arkansas Power & Light Co was specifically mentioned by Robinson who charged that rates paid to the companies by municipal systems are nearly double those paid by co-ops.

A 9-mill-per-kwhr rate charged North Little Rock was contrasted to "just under 5 mills" paid by a Jacksonville co-op. The loss is absorbed by AP&L's charging it off to net income, a move that limits PSC action since it "can't say that the public interest is involved," he declared.

Robinson's views came a few days after an attorney for the Arkansas Electric Cooperative Assn told the group's members that AP&L's proposed increase in wholesale rates to 18 co-ops would raise their payments from the 1958 total of $1.2 million to $1.8 million. If a fuel clause is included, this would rise to $2 million, he said.

The co-op attorney added that investigations are continuing into the building of a steam generating plant in North Arkansas. It is this possibility, observers believe, that accounts for the spread in wholesale municipal and co-op rates.

Union Electric Schedules 350-Mw Pump-Storage Plan

A $50-million pump-storage project will be built near Lesterville, Mo., by Union Electric Co as soon as regulatory approval is forthcoming. The facility will have 350-Mw daytime peak capacity. It will enable UE to postpone a costlier steam plant two years.

The Reynolds County site was found feasible after six years of tests, which determined earlier that a location near Ste. Genevieve was not geographically suitable for the project.

To be called Taum Sauk, the project will have a lower pool covering 370 acres about 1,000 ft below a second pool 1 mile in circumference. A 26-ft dia, 1-mile tunnel will link the pools.

NEW YORK: For the holidays and an anniversary, candelabra and red candles

LONDON: An intermittent glow

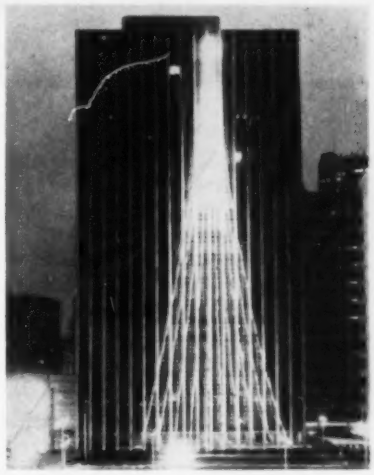
Holiday Lights: Colorful Apex

The decorative function of lighting is again at its colorful apex in the U. S. and in many sections of the free world. In motifs ranging from reverent observance of Christ's birth to the sparkle of Santa's sleigh ride, the lights help brighten the spirit of the season.

For the Bond department stores in New York City, the start of the holidays coincided with a 50th anniversary, so golden candelabra with giant red candles are illuminating the way for shoppers.

Chandeliers 10 ft in dia cast a glow over Regent Street in London. A strike of power plant employees dimmed this and other throughfares for a time, however, as power was curtailed during peak-use hours.

Detroit's 20-story city and county building supports an after-dark Christmas tree that is a 300-ft high tower of light.



DETROIT: A 300-ft high light tower

Tuscaroras Keep Niagara Capacity in Doubt

Attorneys for the New York Power Authority, Federal Power Commission and Tuscarora Indian Nation filled the chambers of the U. S. Supreme Court early this month with argument, legalisms and interpretations, while the ultimate capacity of the 2,190 Mw Niagara project hung in the balance.

Completion of the $700-million project—and even its FPC license—has been in doubt over a year, since a U. S. Court of Appeals upset the FPC's earlier license. The lower court had upheld the Tuscarora's complaint that a license could not be issued unless FPC could find (under Section 4 (E) of the Federal Power Act) that flooding of 1,383 acres of Tuscarora lands would be consistent with the purpose for which the reservation was created.

The FPC and the power authority promptly appealed this ruling to the U. S. Supreme Court.

Under order of the lower court, the FPC also reconsidered the flooding of the reservation. It decided, grudgingly, such flooding would be inconsistent with the reservation's interests—but emphasized that it felt such a decision was beyond its authority and, that as far as FPC was concerned, the license should be issued.

Arthur Lazarus, Jr, Tuscarora attorney, told the high court, "The project cannot be built to planned capacity without the use of the Tuscarora lands, and they (New York and FPC) claim, of necessity, the lands must be subject to condemnation. But whether the lands must be condemned is a question for Congress . . . They cannot substitute the need for the lands for Congressional sanction for condemnation."

J. Lee Rankin, U. S. Solicitor General, representing FPC, insisted the 1957 act's passage already authorizes condemnation. He said the FPC license should be allowed to stand because: **1.** "Public Law 85-159 (1957) constituted the federal approval needed . . ."

2. The Tuscarora reservation doesn't come under provisions of section 4 (E) of the Federal Power Act, anyway, because the lands are owned by the tribe, and 'reservation' in the power act comprehends only lands owned in fee by the U. S."

Actually, construction of the project is going ahead—except on the reservation. Whichever side the Supreme Court upholds the issue probably will wind up in the arms of Congress.

GE Takes Wraps Off

- **At Utility Sales Executives' Conference in Louisville, the company outlines total-electric Residential Market Development Program**

- **It also pushes capitalization of service entrances with bid to 'Correct and Capitalize'**

MEDALLION HOME MODEL is explained by GE's George Bogard (right) to West Penn's Power Co Vp Robert MacDonald (center) and Hawaiian Electric's Herbert Heinrich

Against a background of comedy, song, showmanship and jazz, General Electric Co revealed last week its new Residential Market Development Operation, a program to "help accelerate the growth of the residential market for electrical products and electricity."

GE took the wraps off RMDO—as it has come to be known—before some 250 utility executives at the company's annual Sales Executives Conference at Appliance Park in Louisville, Ky. The two-day session was aimed at acquainting the utilitymen with GE's sales view of the coming decade, of what it calls "The Golden 60's."

Headquartered in Louisville

The Residential Market Development Operation will be headquartered at Appliance Park under the direction of the Park's Utility Relations Manager George T. Bogard. But Bogard is quick to point out that RMDO is not an Appliance Park operation solely. "The new Residential Market Development Operation is company-wide. We expect that every department and division in the company which has an interest in the increased sale of kilowatt-hours will have a hand in the program."

RMDO is aiming at the total electric home; of selling, as one speaker put it, "the total electrical contents of a home." Said Nela Park's Jim Forbes in this connection, "For years we've been selling as a package the total electrical requirements of, say, a new factory, but when it comes to doing the same thing for a home . . . we are only getting around to it." This all-electric approach will support the industry's Gold Medallion Home program in theme and copy.

The logical target of RMDO, aside from the general public, of course, is the new-home builder. GE plans to work with him through a local-level triumverate made up of the utility, the GE distributor and an RMDO regional representative. This regional representative—there will be six of them stationed around the country—is what the company is counting on to make the program really effective at the local level. This same technique was used by GE when the company established the Live Better Electrically program, now under EEI's National Electrical Living Program.

These regional men (see map on p 33) will be located in major cities within their respective regions. In the Northeast, C. A. Graham will handle the program from New York. LBE's C. D. "Dud" Foster will be responsible for the East Central Region, operating out of Cleveland. The Central Region RMDO man will be C. E. Mighell in Chicago. R. C. Haas, another LBE veteran, will take care of program needs for the Southeast in Atlanta. In Dallas, Frank Ondrovik will handle the Southwest; and in the Western Region, F. M. Falge, also a LBE man, will be responsible from his San Francisco office.

Goals Tied to Medallion Homes

What are the program's immediate goals? For 1960, it looks something like this:

GE is predicting that 137,000 of the expected 1.1 million housing starts in 1960 will be Medallion Homes. Of these, 107,000 will be Bronze Medallion Homes, and the remaining 30,000 will wear the Gold Medallion. GE's share of the market is pegged at 27,000 Bronze and 7,000 Gold.

In terms of kwhr consumption, the new program goals, if realized, could mean that a Bronze Medallion Home would use about 11,000 kwhr annually, and Gold Medallion Home about 25,000 kwhr. This is compared to today's annual consumption, which GE puts at 3,900 kwhr. (See table to the left.)

So far as the sale of manufacturers' equipment is concerned, Bronze Medallion Homes could account for $1,060 compared to the

Market Comparisons as the New GE Program Sees Them

	Average New Home	Bronze Medallion	Total Electric Gold Medallion
Kwhr Consumption.....	3,900	11,000	25,000
Manufacturer's Equipment.	$575	$1,060	$3,020

New Residential Market Program

$575 GE figures today's home to be worth in equipment value terms. The equipment figure more than triples—$3,020—in the case of the Gold Medallion Home, says GE.

Regarding its general objectives, the new program lists them under "Promotional Needs" and "Promotional Solutions." They are broken down thus:

Promotional Needs—1. To support Live Better Electrically; to add the corporate strength of all GE products departments to the nationwide promotion.

2. To cash in on the Medallion Home concept being used so successfully by utilities.

3. To compete more effectively for the consumer dollar against other goods and services; to offset the increasing promotional efforts of the gas industry.

Promotional Solutions—1. Implement national market development activity at the local level, and put before the consumer an electrical living program he can buy *now*.

2. Provide a GE Gold Medallion Home equipment "package" that can be tailored to individual builder's requirements.

3. Supply coordinated promotional "packages" with the help of utilities, builders and trade allies, to help sell the Gold Medallion Homes.

Although the key to the new GE program will be the regional managers, they will not be the whole of it. A program of national advertising in magazines and TV will begin early in '60. The Feb. 8 issue of Life will kickoff the program with a nine-page "advertacular," covering lighting, appliances, heating and cooling and other elements of the Gold Medallion Home. All GE-sponsored TV programs, beginning Jan. 31, will promote the benefits of the all-electric home. Local co-op advertising will be used to tie in. One GE spokesman estimated the initial cost of the Residential Market Development Program at slightly more than $2 million.

While the promotion of appliances and lighting will be across the board—or rather, the country—the promotion of electric heating and the heat pump for Gold Medallion Homes will be selective. GE intends to recognize some of the difficulties experienced thus far in the sale, operation and servicing of the heat pump in certain northern areas, and will not recommend it "Where its operation will not prove economically feasible." Instead, says Robert D. Graham, general manager of the company's electric heat section, "We will recommend that type or combination of resistance heating devices which best satisfies the customers needs."

'Correct and Capitalize'

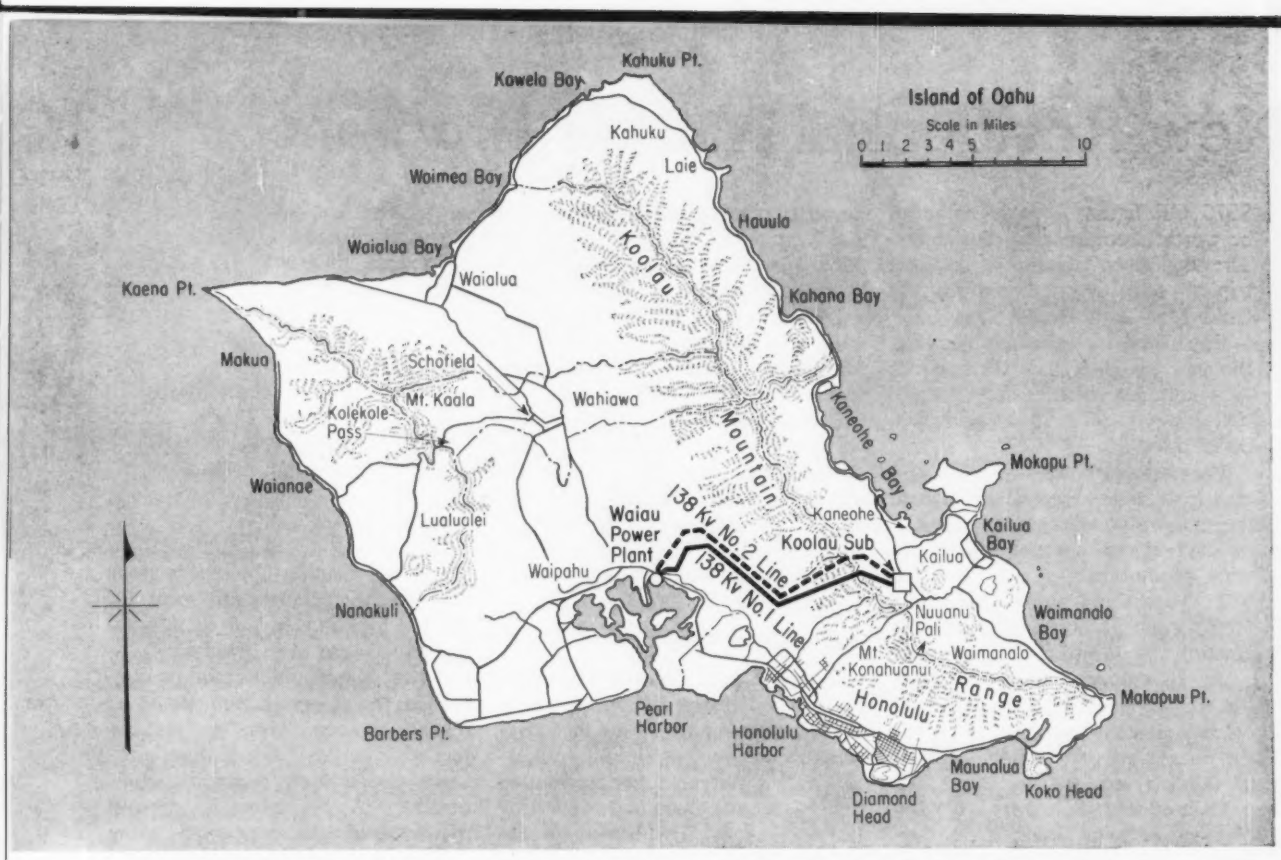
But if the new Residential Market Development Program held center stage in a highly theatrical two-day session, it did not do so always. Utilitymen got a detailed analysis of the sales and marketing problems they are likely to encounter in the 60's from Middle West Service Co Vice President Malcolm R. Rodger, along with a set of arguments for utilities to capitalize everything right up to (and beyond?) the electrical service entrance on a home. Pointing to increasing gas competition and declining per cent returns, Rodger called on utilities to give "thoughtful consideration" to such capitalization. He added that it would help solve the wiring bottleneck. "We have noted the shifting of system peaks and how the increased sales of large use high per cent return appliances can be the key to improved company earnings" . . . and "We have further noted that appliance dealers select installation allowances as one of their preferred sales aids. A review of the . . . problem shows that we should correct the service entrance bottleneck. We have no alternative."

The company also outlined its 1960 line of major appliances along with general promotional plans for them. Lighting and air conditioning plans were also unveiled.

So far as air conditioning is concerned, the company admitted some disappointment with its experimental line of "Thermaline" air-valve reverse-cycle room air conditioners. C. W. Moeller, general manager of the air conditioning department, tacitly admitted that the company was abandoning the air-valve concept, and was returning to more conventional designs.

The company also gave the utilitymen a look at its "Contemporary Collection" of kitchen designs, and plans to make available to them a brochure on it with the idea that some of the appliance display ideas embodied in it can be adapted in utility showrooms.

REGIONAL AREAS for GE's Residential Market Development Operation number six. The cities in which RMDO managers are based are also shown on map



TRANSMISSION LINE NO. 1 at 138 kv from Waiau Plant to Koolau Substation is the beginning of new backbone system. Plans include a parallel line and extensions three ways. Line coming back to coast will be 44 kv

Oahu 13-Mile Transmission Lines

Hawaiian land costs prompt fewer circuits at higher voltage in new backbone system

GEORGE JACROUX, Transmission Engineer, Hawaiian Electric Co, Ltd., Honolulu, Oahu, Hawaii

Expensive land and difficulty in obtaining rights-of-way prompted Hawaiian Electric Co to build 138-kv transmission lines over the 13 miles between Waiau and Koolau. The number of 44-kv lines for transmitting foreseen blocks of power would have been uneconomical. Normally the company generates at 11 kv and transmits at 44 kv.

The most economical plan was to expand the steam power plant at Waiau and install a 138-kv backbone transmission. The first 50-Mw unit of the two-unit outdoor plant is under construction at Waiau, where two 40 and a 15 and 7.5-Mw units are in operation.

Two separate 138-kv circuits could bring Waiau power to Koolau, although later the portion of line out of Waiau would require four circuits at 138 and two at 44 kv, as the backbone system expands in several directions. Double-circuit steel towers were built for the short distance, the basic span being 1,000 ft. The two lines are roughly parallel, having a minimum center-line spacing of 132 ft between the 75-ft-wide rights-of-way.

The most economical conductor for present needs is 556.5-MCM, all-aluminum. Each circuit was designed for bundling a similar conductor 16 in. vertically below. Vertical bundling was practicable because icing is no problem. This configuration can be added to easily in the future. About 3,000 ft of one conductor have been bundled for experience.

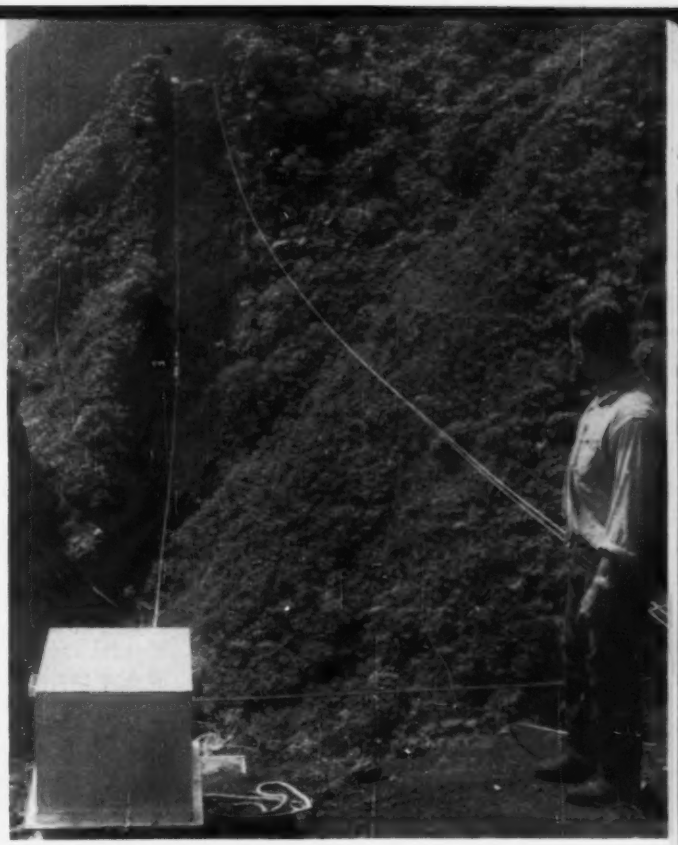
In the foothills beyond the steel-tower section, wood-pole, H-frame structures with a 35-ft pole spar were found to be most economical. Although these were designed for one circuit, that circuit can be bundled. This provision cost very little extra—a few Class 1 instead of Class 2 poles—as the added guys, hardware, and supports for bundling can be provided when the second conductor is installed. The smaller tension of all-aluminum conductor was a big factor in the design of the wood structures for future bundling.

ACSR, first contemplated for the long spans from ridge to ridge in the foothills, was abandoned in favor of the all-aluminum conductor because the deep valleys allow large sags. The longest span is 2,910 ft. All-aluminum-alloy conductor is on the mountains' windward side, where more strength-per-weight was required for minimum sag. It is expected to stand up well in that corrosive marine atmosphere.

In that area, elevation changes more than 2,000 ft in a distance of 3,000 ft, and much of the area is inaccessible. As the alloy conductor is light and strong,

WAIAU PLANT, whose Unit 5 is in background, will supply steel-tower line passing through sugar cane field

ALUMINUM TOWER was erected on the top of Koolau ridge whose marine atmosphere would corrode other metals



CATENARY SUSPENSIONS from ridges support insulators for line conductors (left) and attachment for ground wire

Are More Economical at 138Kv

only one suspension support is needed near the top to hold the circuit in the middle of an eroded vee-shape pass. This support, together with stainless steel guy, is used where a conventional structure cannot be erected. A hand winch with aluminum cover installed at one end permits lowering the support.

Tram Brings Materials

So important a line required a shield wire. One ⅜-in. EHS galvanized steel guy is used on the steel towers with a shielding angle of 30 deg. On wood structures two shield wires give the same shield angle over the outside wires. The line is insulated with eight 15,000-lb, 5¾ x 10-in. strain insulators in suspension. Ten are on angles and deadends. Insulators at the upper end of the alloy conductor are 25,000 lb. Although most of the line is over rough terrain, the part on Koolau ridge presented the most difficulties because of the lack of roads. Closest point on the leeside road was almost a mile from the ridge top. Materials had to be brought in by a ¾-in. cable tram, a ½-in. cable pulling the carrier up the tram. Clouds on the ridge and abundant rain impeded construction.

For corrosive conditions on the wind-swept side, an aluminum tower was erected, stainless steel shield wires extending to the first supports on either side. Reduced maintenance costs are expected to compensate for the higher construction costs.

The line will operate for two years at 44 kv. Four-unit strings of suspension insulators on structures for about a mile out of each station will prevent excessive surges from reaching the 44-kv station arresters. They will protect against flashover of excessively high-voltage surges. These suspension strings will be enlarged to 138-kv insulation later, or will be removed. Dead-end and angle strings are for 138 kv.

Aerial photo contour maps for about two-thirds of the proposed route proved of great assistance in laying out the line. But the final line contour had to be taken by ground survey. Heavy undergrowth, trees of 100 ft, and all-year foliage complicated aerial photography.

The right-of-way was surveyed by triangulating the main location points on high areas. The profile was then surveyed, except in deep valleys where the line would clear. The profile for the windward slope was derived from a contour map made from photographs.

The rest of the profile was taken by stadia on a straight line between the main location points. This involved cutting a trail through dense brush and undergrowth. Actual ground conditions revealed a difference from the impression obtained by looking over the tops of brush and trees. An old road, entirely overgrown at the upper end of Moanalua Valley was opened up by bulldozer for jeep travel. From the end of this road, a trail was cut for about 1½ miles through dense jungle to the mountaintop.

Dispatch

Dispatching system controls 92% of Commonwealth Edison's generating capacity, ie 37 generators, ten plants

DISPATCHING OFFICE in Chicago has computer-controller which matches generation at various stations to load

DAVID W. GILMAN, Station Electrical Engineering, Commonwealth Edison Co, Chicago, Ill.

The automatic dispatching system, recently put in service by Commonwealth Edison Co, controls a net generating capability of 4,636 Mw, about 92% of the system's generating capacity. It not only controls generation to match demand, but selects the combination of generators and the capacities at which they must operate to result in the most economical generation and transmission to load centers, moment-to-moment. (CE's automatic dispatch is the largest of its kind.)

The thinking behind the expenditure of $700,000 was that modern equipment is essential to the satisfactory operation of a large modern power system and to the coordination of the latter's operation with the much larger interconnected system of which it is part. The interconnected system capability is nearly ten times CE's 5,000 Mw.

Expected fuel savings were the prime reason for the installation. But the company also expects the equipment's performance to insure that the rapidly-growing system can play a proper part in the interconnected system operations.

The heart of the new automatic dispatch system is a computer-controller which matches generation to load on the basis of tie-line interchange schedules, frequency, transmission losses, incremental fuel costs and unit incremental heat rates to obtain a minimum production cost. Previously the company used a frequency bias and tie-line controller which had its start in the early 1930's. It regulated one turbine generator against a single tie line. During the 1940's it was extended to send raising and lowering impulses to one unit in each of seven stations.

Additional control equipment was installed at Ridgeland Station in 1955 to receive the impulses and redistribute them on an economic basis to the four units in that station. Economic loading of the rest of the system was accomplished by following station and unit load curves plotted against system load. Although this regulating and loading system had most of the elements for correct dispatching, the system's growing complexity demanded a computer-controller to determine and execute the dispatching function continually and instantaneously.

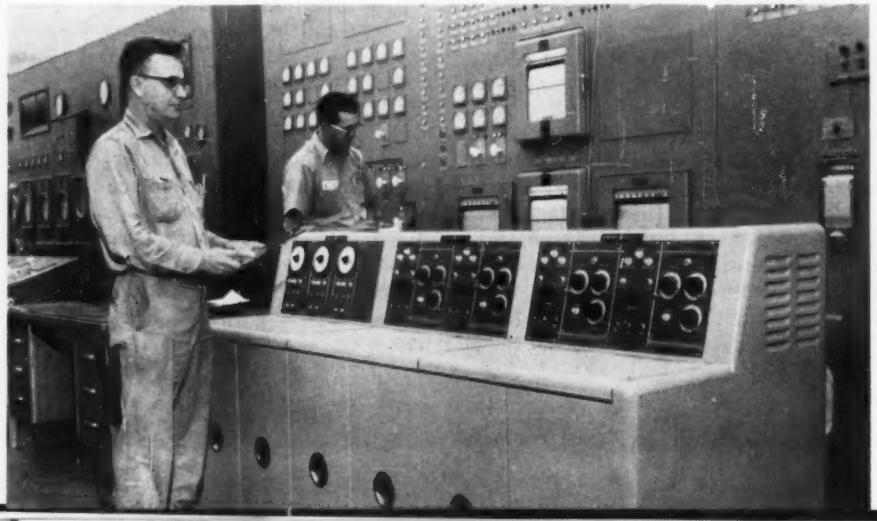
The system has 58 generating units in 12 stations and a total net capacity of 5,021 Mw. Four stations are inside Chicago; eight outside, Powerton Station being the farthest away, about 140 miles. All stations use coal, but eight have both coal and gas burning facilities.

The system is joined to the large interconnected system by ties to the north, south, and east.

Incremental transmission loss studies indicated that all Chicago stations, connected to a 69-kv loop system, should have a common loss or penalty factor. As the outlying stations generally feed into a split transmission system they require more than one penalty factor.

Units are grouped in the stations according to the transmission system to which they are connected. These groups are defined as "electrical stations". Table 1 shows the physical stations, their associated transmission system connections and the number of electrical stations. Adding tie-line penalty factors to the station penalty factors gives a total of 17 transmission penalty factors. Thus the economic load allocation depends upon solving a simultaneous equation involving 58 turbine incremental heat rates, 12 incremental coal costs, eight incremental gas costs, and 17

RIDGELAND STATION contains automatic dispatch equipment regulating the output of four turbine generators. It is one of ten such controlled stations.



4,636 Mw Automatically

transmission penalty factors.

A constantly changing system load, along with the changing availability of units, means that the problem must be solved by computer techniques. As it is the minute-by-minute correction of generation that results in fuel savings, the computer must control generation automatically.

Aurora Station with a net capability of 52 Mw, and Dixon Station with 119 Mw, serve basically local loads. The expense of automatic dispatching communication channels could not be justified for these stations. Some older units at other stations are used for peak shaving only. Thus only 37 units at ten stations are controlled automatically.

The system daily load cycle swings from about 1,600 to about 3,900 Mw on average week days. Minimums and maximums are about 1,500 and 4,200 Mw, respectively. Maximum rate of load pickup occurs at 7 and 8 am and often exceeds 50 Mw per min over a 5 min interval. The maximum rate of drop is less, but the normal noon drop of 250 Mw has taken place in 15 min.

Steel Mills Big Factor

Superimposed upon this load cycle is ±50 Mw of fluctuation due to heavy industrial load, primarily that of the steel mills. One function of the dispatching system is to match CE Co generation to this load. As the CE system is interconnected with other utilities, any difference is made up by power flow over the tie lines.

In addition, tie-line power flow is often scheduled according to amounts of negotiated economy purchases or emergency interchanges. The dispatching system, therefore, regulates CE generation according to deviation from scheduled tie-line power flow. It cannot prevent swings caused by sudden changes in load or generation, but acts to correct CE generation to eliminate the deviation quickly, usually within 2 or 3 mins. Such fast action minimizes unintentional interchange energy, even over a brief time.

Charts from the area requirement recorder for a typical week day morning with the old control, with the new control before the steel strike, and with the new control during the steel strike are shown.

Area requirement represents the sum of the line deviation from schedule plus a frequency bias in terms of Mw per 0.1 cycle frequency error.

In the accompanying charts the frequency bias is negligible, so that the trace represents tie-line deviation. The time covered is from 4 am at the bottom to 10 am at the top. The megawatt scale is 100-0-100, left of center representing a generation deficiency and right of center excess generation.

A comparison of Feb. 20, and July 9 charts shows the magnitude of instaneous swings to be about equal, but the new control is much faster in reducing the error to zero, thus reducing unintentional interchange. The Aug. 17 chart 5 shows the reduced magnitude of swings without the steel-mill load.

The automatic dispatch equipment can be divided into two major components. One is in the dispatching office, in Chicago's loop, and the other the station equipment, essentially identical, at each station.

The dispatching office equipment determines the net deviation of actual tie-line loads from schedule and adds a frequency bias to give the total generation error. The error signal is applied to a combination proportional and reset controller whose output is in selsyn turns calibrated in mills per kwhr. When system generation is too low, the controller turns the selsyn to represent a higher-cost signal; when output is too high, the cost signal is reduced.

The cost signal is sent to all of the station penalty factor units which subtract the incremental costs of transmission loss associated with each electrical station. Each electrical station has its output telemetered into the automatic penalty factor computer which positions the penalty factor units. The output signals of the penalty factor units, which represent the in-

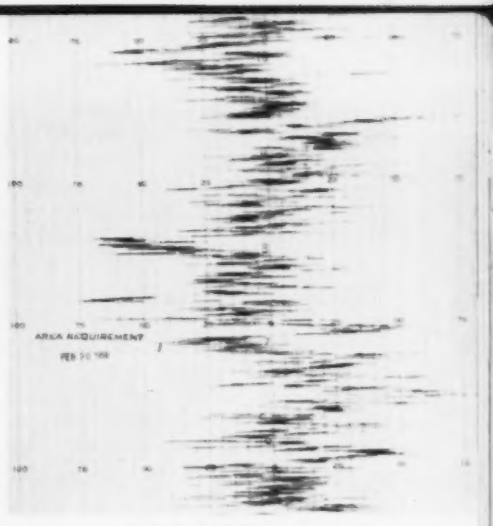


CHART 1—LOAD SWINGS occasionally exceeded 85 Mw before Commonwealth automatic put in dispatch

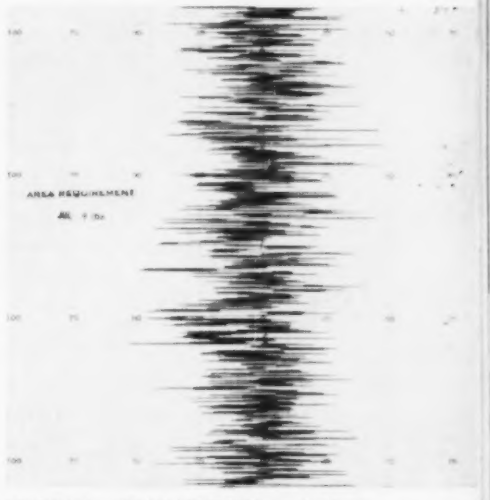


CHART 2—LOAD SWINGS on tie lines were lessened and corrected more quickly with automatic dispatch

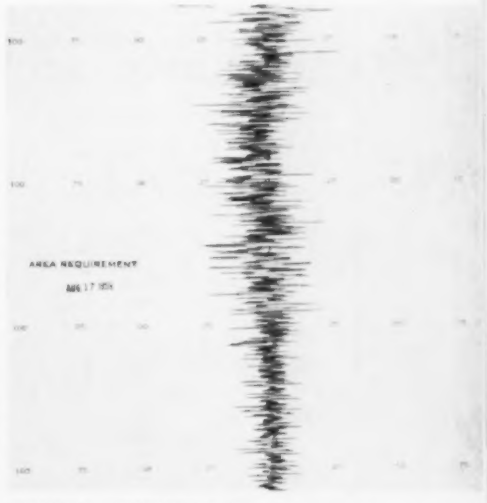


CHART 3—SWINGS (after system was installed) were small and quickly corrected when steel-mill strike cut load

cremental worth of power at the generator buses, are sent to their respective stations.

Several types of communication channels are used. Microwave is employed at Waukegan Station and for the east ties. Carrier current is used for Powerton, and leased wires for Joliet and Will County Stations. All other stations use company-owned wire circuits.

At the station, the cost signal positions the incremental cost unit. The cost unit has two outputs, one a selsyn position for regulating action, and the other a dc voltage proportional to station incremental cost. These work in conjunction with feedback devices, a governor selsyn, and a valve position potentiometer, respectively, which are mounted on the turbine.

The governor selsyn is coupled through gear units to the governor motor. The gear ratio is such that the selsyn makes 30 revolutions for a no load to full load unit load change. The unit controller, through a thyraton amplifier, drives the governor motor to make the governor selsyn track the cost unit selsyn. This causes all units to share load swings proportionally.

The dc voltage from the cost unit is fed through a fuel cost adjusting potentiometer to a function generator. The function generator is an electronic device for storing the incremental cost curve for the unit with which it is associated. The curve is plotted as incremental cost vs valve position. For a given dc voltage input representing incremental cost, the function generator's output is a dc voltage corresponding to unit valve position for that cost. This output voltage is compared with a voltage obtained from the valve position potentiometer on the turbine which represents actual valve position. The difference voltage is used to initiate a control action that repositions the governor, thus forcing the unit output to the proper incremental cost level.

Protection Built in

The maximum rate of change obtained from the economic loop has been limited to 1% of machine capacity per min. Valve position feed back was chosen over Mw feed back because of its accuracy as a measure of input fuel cost is less sensitive to any variations from the normal operating conditions.

The regulating circuit and economic circuit are connected differentially, so that governor action is the sum of the two control functions.

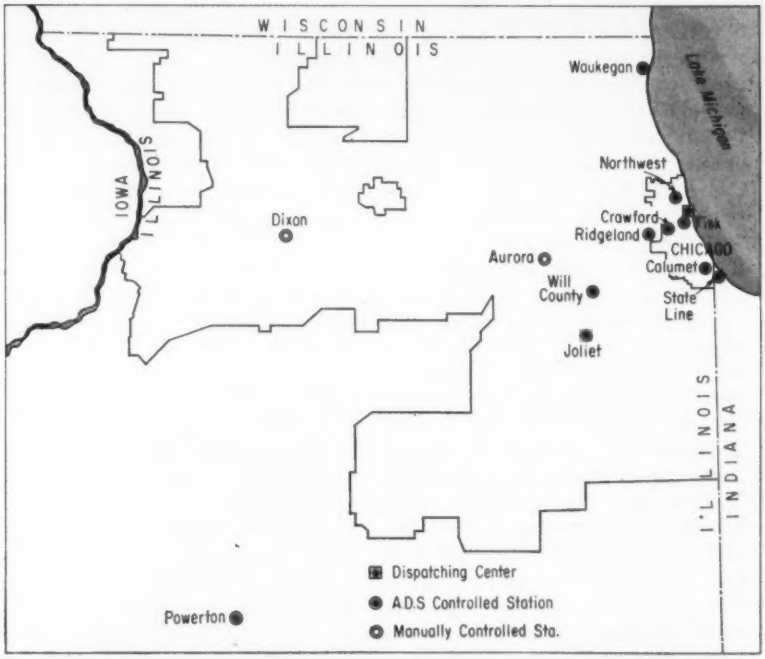
Several protective features have been built into the system. Being a selsyn type control, it is inherently fail-safe on loss of any component. The control equipment is tripped to standby by any telemeter signal failure, or by an excess area requirement. Loss of the control signal trips the station equipment. Failure of the unit to follow the automatic command causes the unit to be tripped off control. Operation of the governor control switch also takes the unit off control.

The automatic dispatch equipment has been in service since April, 1959, and results have been highly satisfactory. Tie-line swings and unintentional energy interchange have been reduced. The value of the actual fuel savings has not yet been determined, but the performance of the equipment appears to promise the most economical minute-to-minute generation that can be obtained on so large and complex a system.

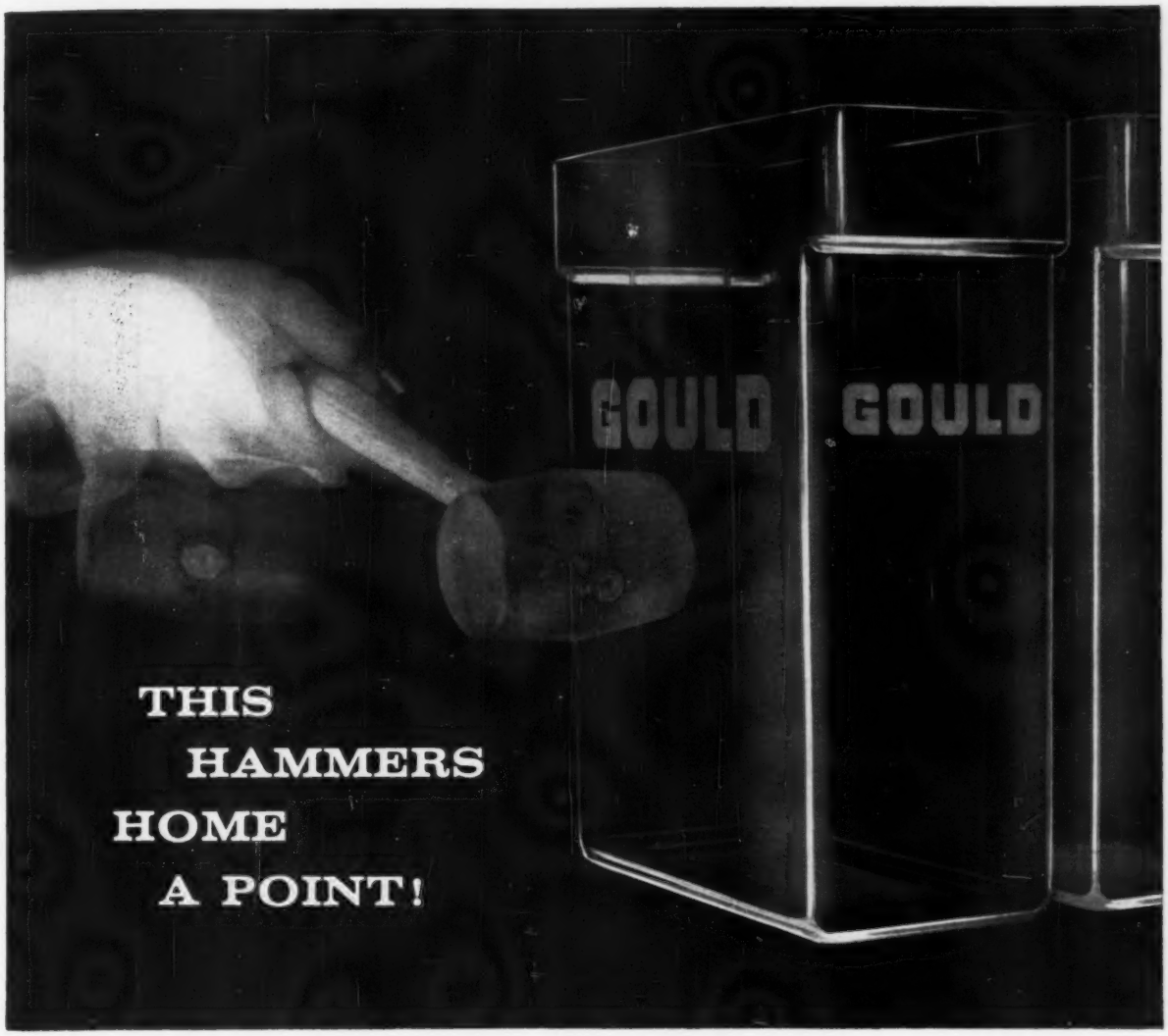
Power Stations, Associated Transmission Systems, Electrical Stations of Commonwealth Edison Co System

Station	Electrical Stations	Transmission Systems
Calumet....	1	Chicago 69 Kv*
Crawford...	1	Chicago 69 Kv*
Fisk.....	1	Chicago 69 Kv*
Northwest..	1	Chicago 69 Kv*
Ridgeland..	3	Chicago 69 Kv* 138 Kv Red 138 Kv Blue
State Line..	2	69 Kv 138 Kv
Waukegan.	2	138 Kv Red 138 Kv Blue
Joliet.....	2	138 Kv Red 138 Kv Blue
Will County.	2	138 Kv Red 138 Kv Blue
Powerton...	2	138 Kv 230 Kv
Dixon.....	1	138 Kv

* Common penalty factor equipment.



SERVICE AREA MAP shows the locations of Commonwealth Edison's 12 stations which contain 58 generating units, 37 in ten stations under the control system



Gould Stationary Battery Jars are Practically Indestructible

New Stationary Batteries in Plastrite Jars offer the same long life for which Gould has always been famous.

Gould Plastrite Jars have a higher tensile strength than most Stationary Battery Jars . . . will withstand greater impact than ever before! This means you'll be free from breakage in handling and shipping.

Plastrite Jars are a feature of Gould's all new batteries for stationary service. Lighter weight makes the jars easier to handle . . . original shape maintained because of higher heat resistance, higher elongation characteristics of Plastrite material.

Same Capacity, Smaller Size. Gould Plastrite Jars save you 30-40% floor space . . . give you the same capacity in a smaller size battery. They're available in Planté, Calcium, and Kathanode. For more details, write today or call your local Gould Office listed under "Batteries—Industrial" in the "Yellow Pages." Gould-National Batteries, Inc., Trenton 7, N. J.

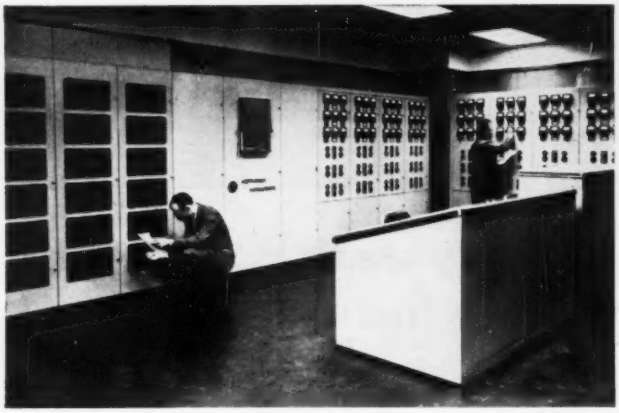
More Power to you from **gould**

COMPACT

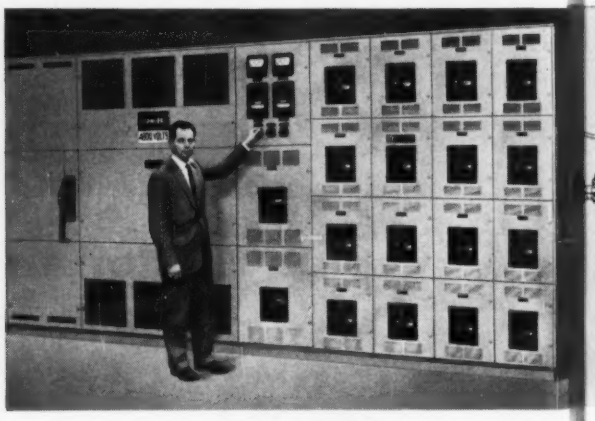
What! Call this giant 138 kv switching station compact? Yes indeed. In fact, it takes up an area roughly 30% smaller than would be required by conventional open construction. That's because it uses I-T-E isolated phase construction.

I-T-E high-voltage metal-enclosed switching stations can be installed in relatively small spaces with complete safety to personnel and nearby equipment. Maintenance is considerably easier. And in addition you are assured of better service continuity through virtual elimination of phase-to-phase fault risk. All conductors are completely enclosed.

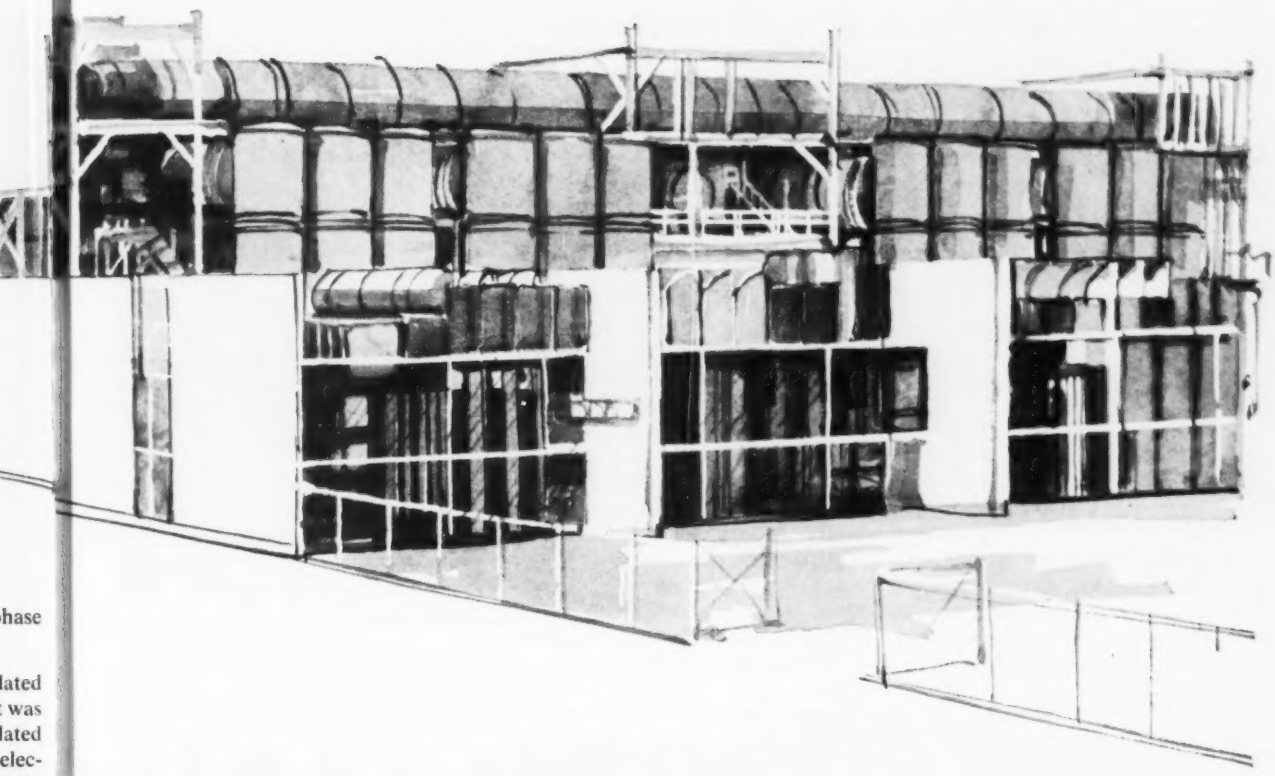
The 138 kv installation illustrated was made at Consolidated Edison, New York. It was the first at this high voltage. It was logical that I-T-E should supply it. I-T-E introduced isolated phase bus . . . in 1937. Today some 25% of the nation's electric power flows through I-T-E bus. And other big advances in electrical equipment keep coming your way from I-T-E.

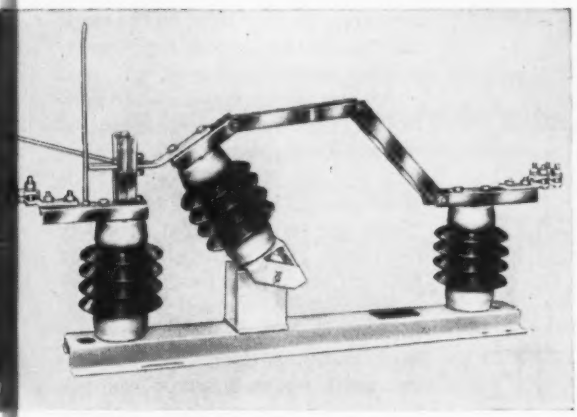


Duplicates an entire distribution network. Here at I-T-E headquarters, the I-T-E Network Analyzer gives fast, accurate answers to complex distribution problems. You can rent its services for problems of any complexity. Removable patchboard saves time. While one problem is being solved, the next problem can be set up. Five-degree phase shift design permits direct load setting on panel face. Automatic regulation maintains loads even though voltage changes. High impedance, 4000-ohm, 25-milliamp base prevents component damage from high currents. Resistors and reactors are separate, can be set independently.



New, more compact secondary unit substations. Save space at your generating station. Now I-T-E secondary unit substations need less space than ever. K-LINE circuit breakers stack four high in ratings up to 600 amp. They save roughly one-third in space. In addition, you get these other K-LINE advantages: quick manual make, closed door drawout even to disconnect position, expanded range trip unit that multiplies the application range. Only I-T-E builds these substations in a single plant . . . coordinating engineering and manufacture of interrupting switch, transformer and switchgear, and giving you better assurance of on-time delivery.





Shuntless tilting insulator switches. Note the absence of corrosion-prone flexible braid on I-T-E Tilting Insulator Switches. Instead they use a durable current-carrying linkage with silver-to-copper contacts at each hinge point. Silver to copper is also employed between the blade and jaw contacts. New crossarm adjustment permits compensation for warpage without demounting switch. Current rating can be increased with parts supplied in an easy-to-use conversion kit. Available with I-T-E LODRUPTER attachments for switching currents up to 600 amp. Switch voltage ratings from 7.5 through 34.5 kv.

I-T-E Circuit Breaker Company U-5
1900 Hamilton St., Philadelphia 30, Pa.

- ☐ Metal-enclosed high-voltage switching stations
- ☐ Network analyzer
- ☐ Secondary unit substations
- ☐ Tilting insulator switches
- ☐ Other .....
- ☐ Outdoor air switches
- ☐ Load interrupter switches
- ☐ Reclosers
- ☐ Distribution cutouts

Name_____ Title_____

Company_____

Street_____

City_____ Zone____ State_____

SEND COUPON OR WRITE

Get complete, up-to-date information on I-T-E equipment.

I-T-E CIRCUIT BREAKER COMPANY

Read Meters Automatically

CURTIS M. COOPER, Binghamton, N. Y.

In the future, it may be possible to read customers' meters without entering their premises, and data may be delivered automatically to computing and billing machines of the punch card type. Telephone lines can be used in a way that would meet all of the telephone company's electrical requirements with no invasion of privacy or annoyance.

The author's system is operated by punched cards, each of which has been prepared by punching in a customer's name, address, folio number, telephone number, and previous month's reading. Cards are fed into a sending machine which allows contacts through the punched holes to energize a telephone call transmitting unit which, if the line is clear, energizes the reading elements on the customer's meter at the other end of the line.

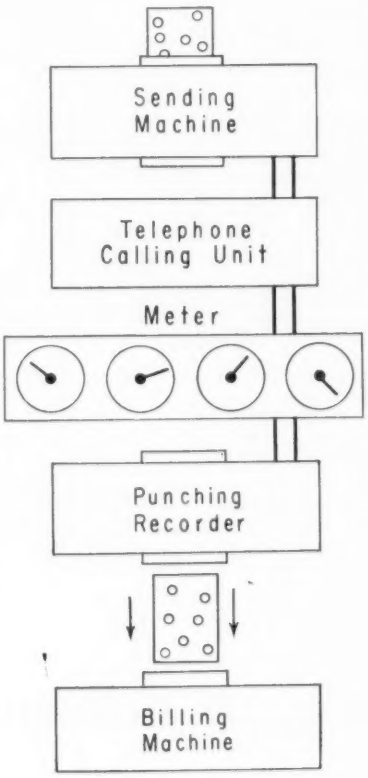
These elements send back successive short electrical impulses to punching recorders of the step-by-step type which accumulate the data and punch the meter reading on a customer's billing card. The mechanism is then cleared for the next customer.

The punch-card-operated sending machine has contacts which pass current through circuits where holes have been punched in the card, while blocking all circuits whose terminals are at unpunched parts of the card.

Each dial number contact made through holes punched in the card energizes a separate solenoid for each particular digit of every possible telephone number. Each solenoid cocks a dialing number element such as a multiple contact wheel, ratchet, or other step-by-step mechanism, so that when the element is later released it will send out the number of impulses corresponding to that digit. When a complete telephone number has been accumulated in storage elements, each held in a cocked position, they can then be released in proper order to connect to the customer's line. As each solenoid is an individual circuit, the punched card can activate them simultaneously, and the complete number can be set up in the storage apparatus immediately.

The apparatus at the customer's location includes elements associated with meter shafts to pick up electrical impulses according to meter reading and transmit them back to the accounting office. Each number on a meter dial is an electrical contact point contacted by a wiper arm. As the wiper arm passes over the contact points it sends impulses to the accounting office according to the number of points contacted. The arm is mounted on a shaft which is concentric with or an extension of the meter shaft so that, while independent in action, they turn on the same center line.

Before dialing a number, first it is necessary to see if the line is open. A connection is made that is sensitive to the dial tone to make sure the line is not busy. If the dial tone is present, the connection is maintained to allow the meter reading to come through. If a busy signal is found in place of the normal dial tone, a kick-out switch tosses out that punch card and restores all numerals in storage to their initial position.



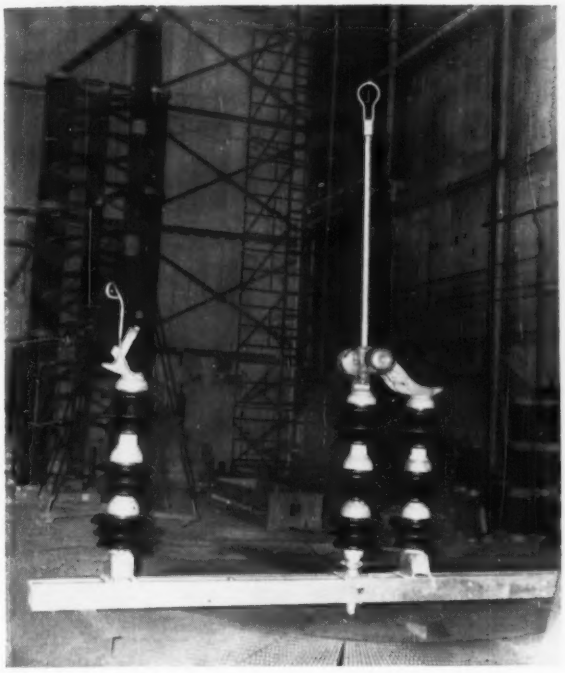
It is generally preferable to operate the meter reading mechanism in the hours after midnight when very few lines are busy. As the central unit is synchronized with the telephone ringing equipment so as to read the meter between ringing sequences, the customer is never disturbed. If by any chance the customer happened to lift the telephone receiver at the exact time the meter reading process was taking place he would hear the busy signal. However, by the time he replaced the receiver and picked it up again, the line would be cleared.

All the timing elements are controlled either by thermo-switches for the briefer periods or motor-driven time switches for the longer periods where a cycling control is desired. These are set up so that generally the entire cycle of operation may take ten seconds or less.

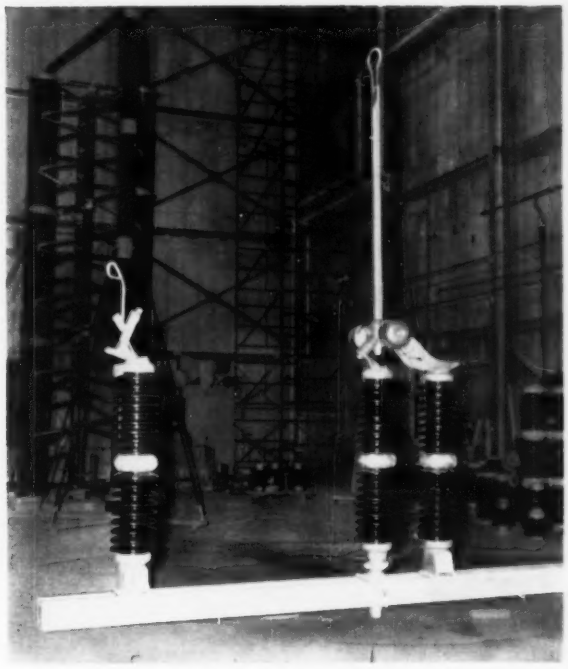
The patented method is designed for 300 to 360 meter readings per hour. With further developments the speed is expected to be doubled, and leased long distance lines can be used. This will permit one billing center to serve several communities.

It is estimated the equipment at the customers meter installed on new meters by the manufacturer would cost less than $5. The cost of the central unit is not considered a factor, because this cost would be spread over many meters.

The idea was first conceived by W. Arthur Sprague, uncle of the inventor and head of the general accounting department of New York State Electric & Gas Corp, Ithaca, N. Y.



138kv Delta-Star MK-40 Switch with cap-and-pin-type insulators, set up for impulse test. Results shown in accompanying table.



138kv Delta-Star MK-40 Switch with station-post-type insulators, set up for identical impulse test. Results shown in accompanying table.

Lab tests prove Delta-Star Switches exceed NEMA safety requirements

- **Safe for positive impulse flashover**
- **Safe for negative impulse flashover**
- **Safe with cap-and-pin insulators**
- **Safe with station-post insulators**

High-voltage impulse tests on Delta-Star Switches prove that, *regardless of the type of insulators used*, all Delta-Star Switches exceed NEMA, AIEE, and EEI safety-factor requirements. Actual test results on a typical Delta-Star Switch, equipped with both cap-and-pin and station-post insulators, are given here.

Actual test values, not published values, used to determine flashover characteristics, prove Delta-Star Switches safe under *all* conditions. These tests indicate that the switches exceed NEMA requirement of 10% safety factor with both types of insulators. DELTA-STAR *GUARANTEES* SAFETY—BY TEST.

For additional information call or write *Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 Fulton Street, Chicago 12, Illinois.*

IMPULSE TEST ON 138kv MK-40 SWITCH

SWITCH POSITION	WAVE	CAP-&-PIN INSULATORS	STATION-POST INSULATORS
Insulator flashover; Contact energized	positive	725kv	766kv
	negative	972kv	1082kv
Insulator flashover; Hinge energized	positive	722kv	776kv
	negative	871kv	1074kv
Switch open; Gap flashover	positive	924kv	974kv
	negative	1191kv	1224kv
Safety Factor	positive	27.5%	25.5%
	negative	22.5%	13.1%

DELTA-STAR PORTER ELECTRIC DIVISION

H. K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION, PEERLESS ELECTRIC DIVISION; Specialty Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION, H. K. PORTER COMPANY de MEXICO, S.A.; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepcoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.

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Winter aggravates concentrated clamp stresses at suspension points. Repair existing damage before Winter hits; and guard against future damage from arc over and vibration.

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PATCH RODS

Rapid repair of damage to conductors (not exceeding 25% of the outer layer of cable) is best accomplished with Preformed Patch Rods which will restore full mechanical strength and electrical conductivity.

Patented — U.S. Patent No. 2,699,653; other [illegible]

SPLICE SHUNTS

When moisture pockets cause internal corrosion and overheating, failure of the joints may result. To restore full electrical conductivity and mechanical strength, wrap on a Preformed Splice Shunt over the malfunctioning splice.

PREFORMED LINE PRODUCTS COMPANY
DEPT. SP-3
5349 St. Clair Avenue, Cleveland 3, Ohio

Procurement & Products

OUTLOOK ▶ **Electric utility buying will be up in 1960.** Early returns from Electrical World's annual construction budgets survey indicate the increase in spending will be up about 6%. Although outlay for generation will dip—8% according to the early returns—there is expected to be a substantial upturn in new orders for generating equipment. The early returns also show a surprising 26% increase in the amount budgeted for transmission plant, and a healthy 12% jump in proposed distribution expenditures.

SUPPLIERS ▶ **Support for the bright outlook also comes from other sources.** McGraw-Hill Dept of Economics forecast a 7% gain in shipment of heavy electrical equipment, and adds that apparatus manufacturers will operate once again at close to 90% of capacity. General Electric Co, in its year-end review for the press, forecast an upsurge in electric utility orders in the year ahead, but noted that deliveries on equipment with long manufacturing cycles, such as turbine generators, will be down somewhat as a result of the low level of orders received in 1958. GE and other manufacturers look upon 1959 as the low point in a utility buying cycle, and foresee a general climb over the next two-or-three year period.

PRICES ▶ **For industry generally, commodity prices have remained remarkably steady,** reports the National Association of Purchasing Agents in its latest monthly business survey. Of the NAPA members surveyed, 36% said they were paying a little more for items they buy, 59% reported no change, and 5% said their prices were lower.

Prices on the downside included those on electrical equipment and mercury. On the up side were copper, steel (gray market), brass, steel scrap, zinc, tungsten, and die castings, according to the NAPA business survey.

STEEL ▶ **Stockpiles of steel built up for the strike period have been pretty well used up.** Unless a labor settlement can be hammered out before the end of the present 80-day working period, many purchasing agents feel that there will be no opportunity for another inventory buildup.

MARKETING ▶ **I-T-E Circuit Breaker Co announces plans** to inaugurate a national sales program for marketing the product line of the Kelman Electric & Mfg Co, which I-T-E acquired in 1956. Kelman was merged into I-T-E at the beginning of this year and is now the Kelman Power Circuit Breaker Div.

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Readers Service ..... page 107

ADC Line: 1, 2 or 3 U-bolts, No. 6 solid aluminum to 900 MCM ACSR.
U-BOLT
P-U
CENTER BOLT
UCA Line: heavy castings, 1, 2 or 3 center bolts, No. 8 solid aluminum to 715.5 MCM ACSR.
PENN-UNION
2-BOLT
AVT Line: 2-bolt tap, No. 6 solid aluminum to 900 MCM ACSR.
PENN-UNION
Type PCA: 1-bolt tap, No. 6 STR to 1/0 ACSR.
1-BOLT
ALC 15
P-U
ALC Line: center bolt, interlocked fingers, No. 8 solid to 2/0 ACSR.
PAE Line
Bolts
14 solid
.000 MCM

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ALUMINUM BOLTED TAPS

Every Penn-Union tap is *dependable—mechanically and electrically*—carefully designed, thoroughly tested, and manufactured under rigid engineering supervision.

PENN-UNION
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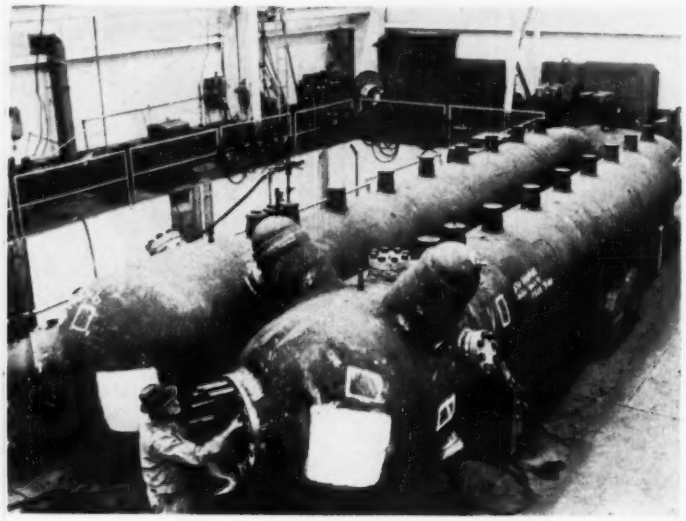
PENN-UNION ELECTRIC CORP., Erie, Pa.

Export Sales—Philips Export Co., 100 East 42nd St. New York 17, N. Y.

Indian Point's First Heat Exchanger Is Shipped



This 60-ton heat exchanger for Consolidated Edison Co's Indian Point nuclear electric power plant (left) is shown undergoing final inspection in Babcock & Wilcox Co's Barberton, Ohio boiler works.

The U-shaped unit, 40x13 ft, contains ten miles of one-inch stainless steel tubing. At the 275-Mw generating plant, the heat exchanger will become part of one of four steam generators. It will use heat generated by nuclear fission in the station's reactor to make steam.

B&W is the designer and builder of the nuclear portion of the power plant. The nuclear system, including the steam generators, will be installed in a containment sphere 160 ft in diameter, made of steel plate one inch thick. Other components B&W is supplying are a reactor core; a 255-ton reactor vessel 40 ft high and 11 ft in diameter; a pressurizer tank 18 ft high and weighing 35 tons; and associated equipment.

The entire plant is set in a 145,000-cu-yd rock excavation on the east bank of the Hudson River near Buchanan, N. Y.

Federal Pacific Launches 8-Month "Power Parade"

Federal Pacific Electric has just launched a traveling exhibit of its electrical control, distribution, and power equipment, which will cover 10,000 miles and tour to more than 30 cities across the nation.

The company's R. L. Bobo, vice president—marketing says, "Now our customers will be able to see a company catalog—'live.'"

Three months' work went into preparation of the "Power Parade." A specially constructed trailer van houses about 50 representative types of the company's equipment—everything from miniature special application circuit breakers to operating mechanisms for utility switchyard apparatus.

Prominently featured will be some of Federal Pacific's newest products, including the Economy fuse line, rotary handle industrial circuit breakers, quick-make quick-break fusible switches, and the company's completely modular stab-in fusible service equipment.

In each city advance men will work with local FP representatives to set up the exhibition and make arrangements for potential customers to visit it. Among those expected to attend, besides utility company personnel, are consulting engineers, electrical inspectors, distributors and contractors, architects, and builders.

First city on the itinerary is Baltimore, after which the exhibit will move on to Atlanta and Birmingham. Other cities covered will be New York City, Newark, Philadelphia, Houston, Dallas, Los Angeles, Santa Clara, Calif; San Francisco, Portland, Oregon; Seattle, Minneapolis, Kansas City, St. Louis, Milwaukee, Chicago, Detroit, Cleveland, Pittsburgh, Boston, Syracuse, and Buffalo. The display will remain on exhibit from three days to one week in each city. New FP products will be incorporated as they are developed.

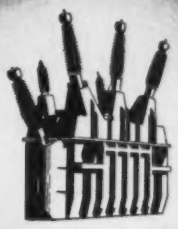
Public Service E&G Orders 325-Mw Steam T-G for Sewaren

A 325-Mw cross-compound, steam turbine-generator has been ordered by Public Service Electric & Gas Co from Westinghouse Electric Corp, for operation in 1962. It will be installed at the Sewaren generating station near Perth Amboy, N. J.

The 3600-rpm turbine will have four rows of 28-in. low-pressure blades, the largest Westinghouse has sold to date. Each of the two inner-cooled generators, cooled by hydrogen under 45 psig, is rated 208 Mva and will operate at 18 kv. They will be arranged for outdoor service, with walk-in enclosures at one end of them.

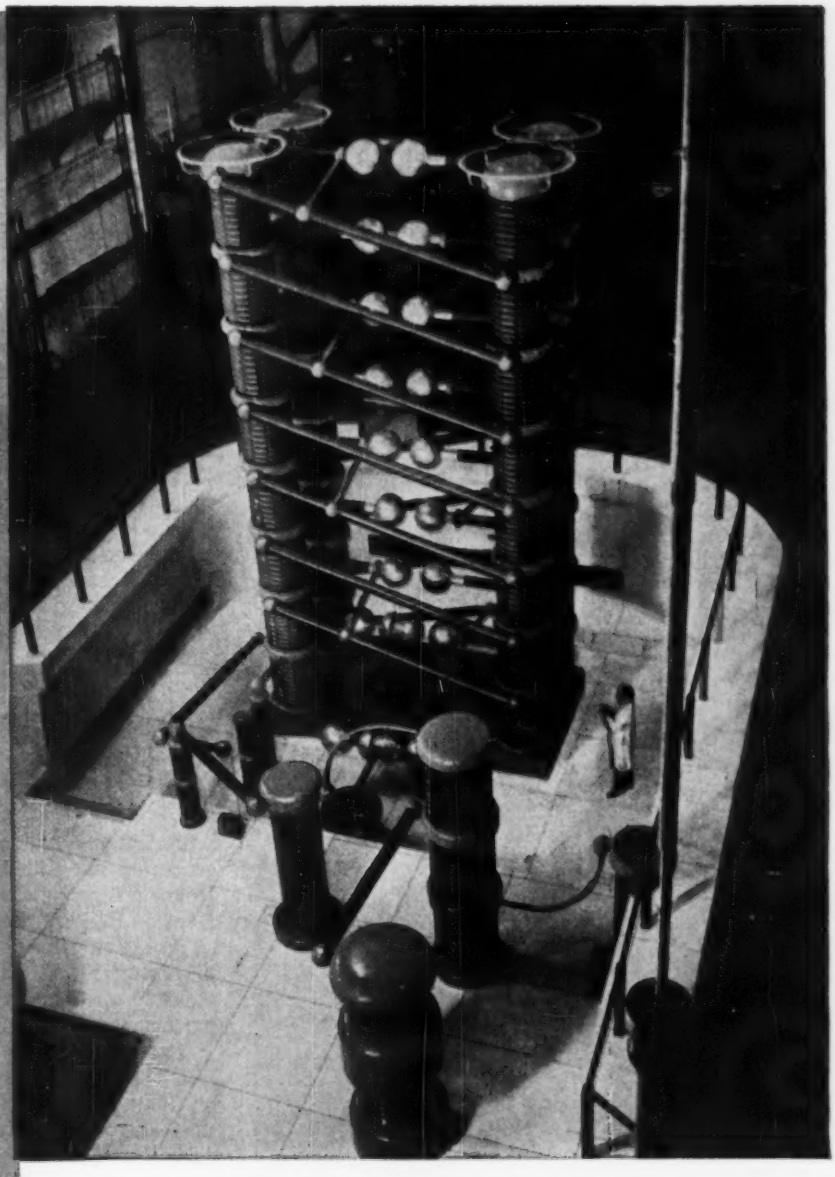
The units will have 75% of total capacity of the four generators now operating at Sewaren generating stations, installed 10 years ago.

(*More News of Manufacturers, p* 50)



Transformer Capacity of over 5,000,000 kVA per annum

The Ferranti transformer plant at Hollinwood, Lancashire, England, covering an area of over 300,000 sq. ft., has a manufacturing capacity per annum of over 5,000,000 kVA of Large Power Transformers, Distribution Transformers, Voltage Regulators, High Voltage A.C., D.C., and Impulse Testing Plant and Specialised Equipment. Contracts include the supply of transformers for the Garrison Dam and McNary Dam Projects in the U.S.A. and the Alcan Project in Canada.



National Physical Laboratory

This Ferranti Impulse Generator at the National Physical Laboratory, Teddington, England, by whose permission the photograph is reproduced, generates 3,200,000 volts and has an energy rating of 77 kW seconds. This is a typical example of the type of A.C. and D.C. equipment manufactured by Ferranti Ltd., for routine and research testing.

FERRANTI

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Ferranti Electric Inc., 30 Rockefeller Plaza, N.Y. 20

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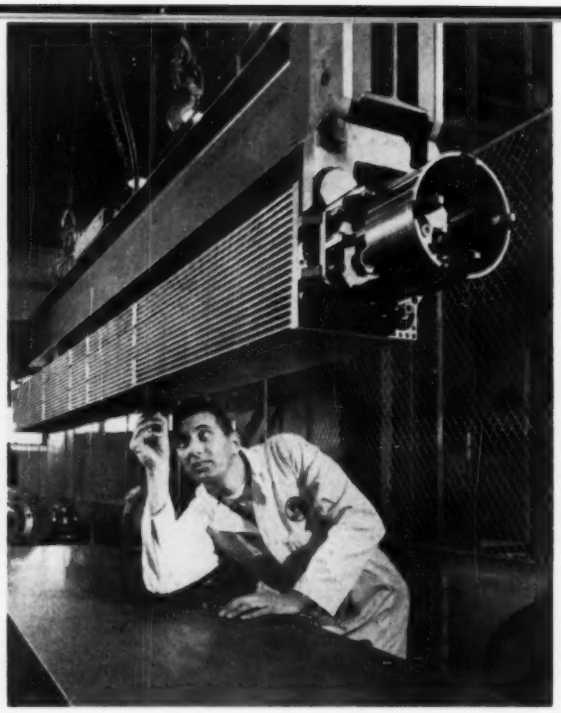


First Fuel Element for Yankee A-Power Plant Completed

One of the first fuel element assemblies Westinghouse Electric has built for the Yankee Atomic Electric Company's power plant at Rowe, Mass, is being given final, detailed inspection before shipment (left).

When completed late in 1960, the 134-Mw plant will have 76 of these units within its pressurized water reactor. Each assembly is about eight feet long and about eight inches square, and is comprised of 304 stainless steel tubes. Each of the tubes contains 150 pellets of slightly enriched uranium oxide.

In addition to the nuclear reactor and its related components, Westinghouse is supplying the turbine generator and other electrical apparatus for Yankee Atomic's Lester, Pa, and East Pittsburgh, Pa, plants.

Scale Model of A-C's 220-Mw Steam T-G Unit Is Inspected

Inspecting a scale model of a 220-Mw steam turbine generator unit Allis-Chalmers Mfg Co is installing for Houston Lighting & Power Co are (photo at left, l to r): Houston L&P's J. F. Estill, Jr, vice president in charge of purchasing; H. G. Hiebeler, general superintendent of power; D. R. Boise, manager of Allis-Chalmers' Houston district, and L. K. Del 'Homme, superintendent of engineering, Houston L&P.

The tandem-compound, triple-flow turbine will be installed in A-C's T. H. Wharton plant. It will operate on 2000-psig, 1000F throttle steam with single reheat to 1000F, and drive a 265-Mva, fully-supercharged generator.

The entire unit will be enclosed in a sectional pressurized housing for outdoor operation.

MANUFACTURERS BRIEFS

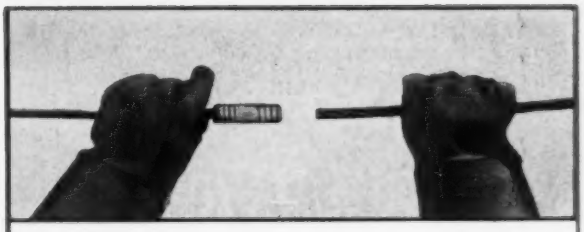
Black Hills Power & Light Co will make one of the nation's first installations of colored aluminum boiler lagging, in constructing the Ben French Station, scheduled for completion late in '60. A spruce green Alumalure was chosen to minimize the traditional industrial appearance of a steam generating station. Made by **Aluminum Co of America,** it will be used for the exterior of general plant buildings, turbine house, breeching, conveyor cover and the coal bunker building, as well as for the boiler lagging . . . **Minnesota Mining & Mfg Co** will build a $10-million, 14-story administration building at its research center east of St. Paul, Minn. This will make space for 1,000 office personnel temporarily housed in laboratory space and fulfill all "foreseeable requirements" for research and administrative facilities, on the 265-acre tract, through the late 1960's or early 1970's . . . **Information Systems, Inc,** (formerly Panascan division, Panellit, Inc), has developed the ISI 609, a solid-state process computer system which simultaneously can provide data for 1) on-line operation and analysis, and 3) off-line analysis using on-line data. The system permits analysis of any process with interference with daily operation, in effect using a plant as a full-scale research project, the company reports.

FARGO'S "PUSH-TO-HOLD" COMPRESSION CONNECTOR

"SNUBBER... SEAL"

1 . . . holds conductor in place freeing both hands for using tools.
2 . . . retains Fargolene Fourteen in bore of sleeve assuring a low resistance, corrosion free connection.
3 . . . color coded and spun in place for permanent, easy size identification.
4 . . . provides a non-metallic bridge between conductor and sleeve eliminating galvanic corrosion in bimetal joints.
5 . . . easily punctured.

The "SNUBBER SEAL" type Fargo Compression connectors are 2⅛" long, have a solid metal barrier between conductors, and are clearly marked for conductor sizes and recommended number of compressions.



1. Skin conductor covering 1¼" from end.
2. Clean conductor.
3. Insert full depth through center "push in" of Fargo's "SNUBBER SEAL"' (a slight twisting motion helps).
4. Hands are free to compress with Fargo's compression tool or equivalent.

Fargo's new "58-R Series" (⅜" O.D.) and "12-R Series" (½" O.D.) are available for any combination of service entrance conductors.

Fargo's #12 and #58 compression tools are recommended for installing "SNUBBER SEAL" connectors.

Ask your LINE MATERIAL Field Engineer for complete details

Manufactured by LINE MATERIAL INDUSTRIES, McGraw-Edison Company, Milwaukee, Wisconsin. In Canada: CANADIAN LINE MATERIALS, LTD., Toronto, Canada.

Manufactured by FARGO MFG. COMPANY, INC., Poughkeepsie, New York. FARGO

Southern Utilitymen Get Sales Growth Tips

But commercial and industrial sales have been neglected, delegates to Southeastern Electric Exchange meeting hear

An information-packed Southeastern Electric Exchange sales conference lured some 250 Southern utilitymen to colorful New Orleans last month to pick up sales tips which will help them to do a better selling job in the year to come.

Program chairman, C. M. Wallace, Jr., vice president in charge of sales at Georgia Power Co, told the delegates, "We are faced with problems of continuing to grow." In the commercial field, lighting levels undreamed of before are possible, he noted, but said "we are faced with competition in every single solitary phase of commercial operation."

There is a tendency for the industrial salesman to be more missionary than anything else, he said. The stage is set for the competitive salesman in this field, he noted.

Residential sales are quite frequently the measuring rod by which operations are measured, he said. The goal of doubling every ten years has been accomplished but it "took a bit of doing" Wallace noted. To reach it in 1968, utilities must show an increase of 330 kwhr per customer per year. "It is a dirty track, travelled by smoke, fumes, and danger of explosion," he said.

Arkansas Power & Light's R. J. Wimberley, filling in for W. M. Shepherd, discussed the Live Better Electrically Program. One hundred and thirty-four companies contributed $2.5 million last year, "showing our members mean business," he said.

Daytime TV will be eliminated from the 1960 program, Wimberley told the group, so increased magazine advertising can be used and thus national manufacturers can better coordinate their advertising.

James F. Crist, vice president of The Southern Co., reversed his subject, "Industry Looks to the South," to "The South Looks to Industry," because, he said, "certainly the effort to attract new industries is a major occupation with all southern utilities, chambers of commerce, state governments, railroads, banks and other organizations."

The South's proportion of the nation's manufacturing facilities has increased to more than 25%, he pointed out. He attributed the rapid industrial growth to: Abundant supplies of fresh water, good year-'round climate, vast stores of raw materials, competent native-born workers, and fast-growing markets.

He listed as problems holding back industrial development:

- If taxes are not fair and reasonable
- The situation that turns private disputes between employers and employees into matters of government, demanding great powers of government to deal with them.
- The mounting influx of foreign-made goods.

Growth Possibilities Cited

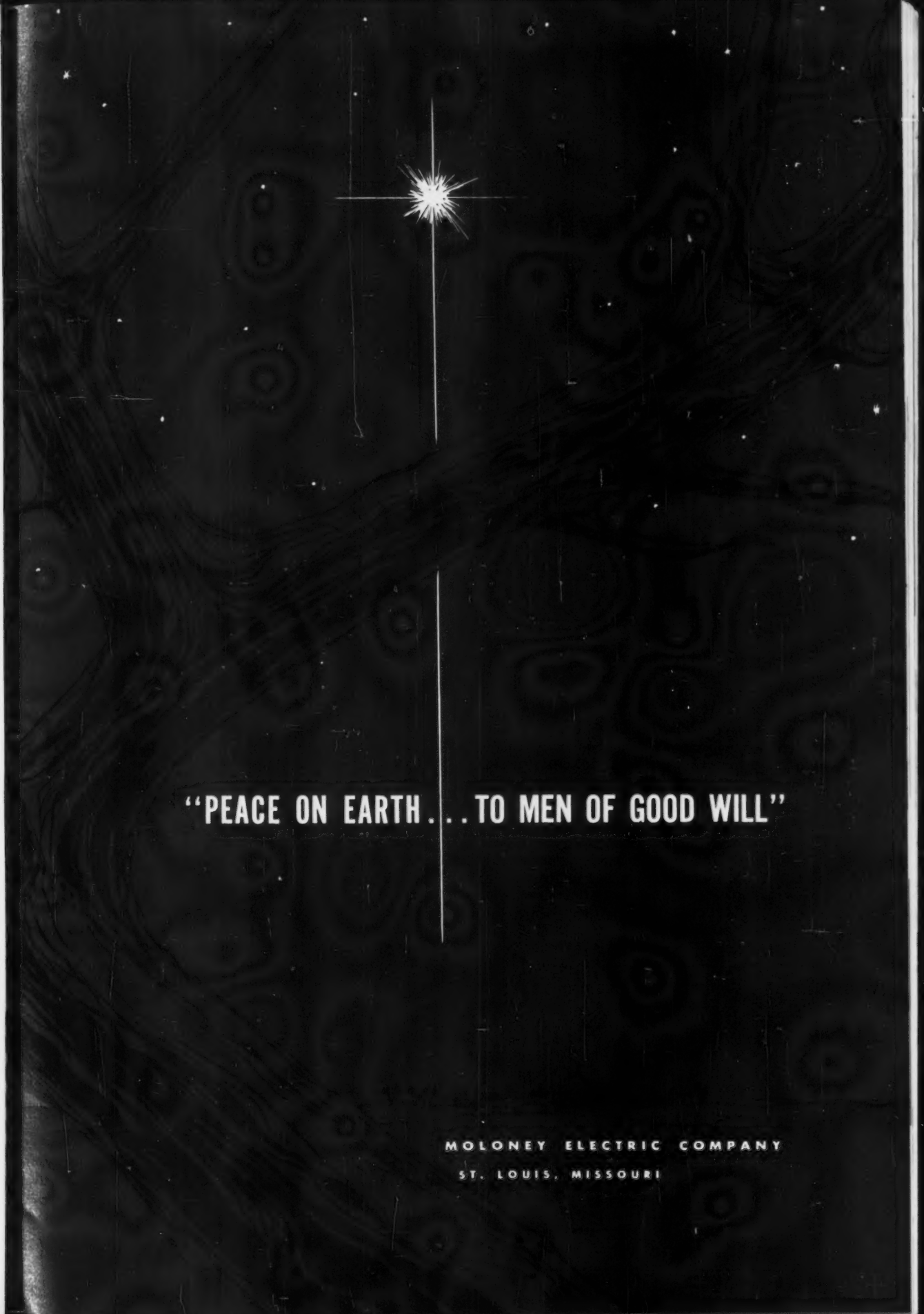
There are growth possibilities in the industrial and commercial field, M. G. Kennedy, Ebasco Services' manager, sales, marketing, and public relations department, said. This is in spite of the fact that when utility sales managers get together they spend most their time discussing residential sales problems.

So, Kennedy put in a plea for equal consideration for the development of the commercial and industrial loads. In 1958, commercial (Small Light and Power) accounted for 17.8% of the total sales and 23.7% of the total revenue. Industrial (Large Light and Power) accounted for 48.4% of total sales and 26.7% of total revenues. And 1958 was not a very good year for American industry, Kennedy noted.

In 1960, sales in these two classes will account for about two-thirds of total kwhr sales, he said. But many companies today have no more manpower and no more promotion and advertising dollars assigned to commercial and industrial sales than they did in 1945.

(*Continued on page* 54)

R. J. WIMBERLEY, Arkansas P&L's ad manager, recognizes a question from the floor at advertising sessions' critique of Live Better Electrically program


"PEACE ON EARTH . . . TO MEN OF GOOD WILL"
MOLONEY ELECTRIC COMPANY
ST. LOUIS, MISSOURI

Southern Utilitymen Get Sales Growth Tips (*Continued from page 52*)

Too much attention is being paid to the "new girl in town" philosophy. He said this means concentrating on new industry and paying less and less attention to older, well-established customers.

"Certainly no one would quarrel with the necessity to put increased money, manpower and promotion effort into getting new customers. But . . . after these plants are established in your area, are they getting the proper amount of continuing sales attention to keep them satisfied customers and enthusiastic users of ever increasing quantities of electric service?" he asked.

"Our Power Plants Are Not For Sale!" was the intriguing message with which A. B. Collins, president, Reddy Kilowatt, Inc., startled the group. He derived it from the fact that utility managements never stop improving the efficiency of power plants. But customer problems do not lie in the engineering channels, he said. They lie in the sales and public relations and accounting channels.

"Does any man in this audience have a power plant for sale?" he asked the group. "Then why do we need emphasis on power plants per se in company promotions?" He likened it to the toothpaste business where the only thing the customer is interested in is whether or not it cleans his teeth, not where the manufacturing plant is. Thus, electric customers just want to know if they can "snap the switches and get good electric service," he said.

Service Problem Explored

Appliance servicing came in for a good deal of attention at the SEE meet. A panel of four representatives—from a manufacturer, a dealer, a non-servicing utility, and a servicing one—explored the problem from every angle.

Joe Rushton, supervisor, major dealer sales, Frigidaire Division, General Motors Corp, told what causes a service problem. This could be one of eight things, he said: "Poor product design, inferior quality or poor workmanship, faulty installation, lack of user instruction, service difficult to obtain, service parts not readily available, inefficient or incompetent repair work, and excessive service charge.

The ultimate solution of the service problem has to start with the manufacturer, Rushton said. He must be imbued with a deep-seated conviction that good product service at all levels is perhaps the most vital element in the continuing success of his business. "However, good service is no substitute for a poor product," he said.

Dealer Gives Views

Claude H. Wolfe, an Orlando, Fla., dealer, stated that appliance retail sales and service go together. A person takes his car to the dealer, not the manufacturer or the filling station; the same goes for appliances, he said.

"The service problems of today will no longer exist when the industry takes the pride it should in the manufacture of its appliances; and the dealer a similar pride in the service he gives," Wolfe said.

Then Hugh G. Isley, general sales manager of Carolina Power & Light Co, told why his company is not in the service business. It felt each participating segment of the industry should share the responsibility. Instead, it established service dealers and independent service outlets so that every part of the service area was adequately provided with facilities and service personnel.

Isley also mentioned a survey which found that dealers don't think utilities should service appliances. Most felt this was the dealer responsibility.

Arthur D. Perkins, Georgia Power Co, explored the other side of the coin. Coming from a servicing utility, he said:

"After the cards are all down, the customer who has been helped or supported, regardless of manufacturer or dealer, in the final analysis is the same person who holds the lifelines upon which depend the very existence of the utility.

"We owe the customer far more than the mere handing to him our product. And we will prosper in direct relation to the service we give," Perkins said.

A plea for skill, care and effort in idea-marketing problems, in comparative amounts to that expended on product-marketing problems, was issued by C. J. Dover, communication consultant, General Electri Co.

Private enterprise is too often losing the battle with its critics, too often fails to use the opportunities provided by communication channels with customers, employees and the public, he said.

Dover listed four steps which he felt would aid in more effective communication.

1. Recognize that effective idea marketing requires essentially the same formula as effective product marketing, and put this formula to work

2. Utilize existing channels of employee and customer communication to tell private industry's story

3. Speak up forthrightly with management's views on specific, controversial issues which affect customers, employees and the public

4. Reject the notion that silence is an effective answer to repeated attacks on the business community.

TEH Support Sought

Complete cooperation of the local utilities in the Total Electric Home Program was called for by W. H. Loeber, marketing manager, National Electric Home Dept, Westinghouse Electric Corp. The Total Electric Home is today's home, he said. It can be any type of architecture in any part of the country. It is completely oriented around the builder, and it must be a Gold Medallion home. He called on the industry to support the program and "walk down the street as a team."

In concluding the conference, G. C. Rawls, president, Louisiana Power & Light Co, said that he was not a pessimist about the electrical industry.

He listed its problems as growth, government intervention, taxes and inflation, but said, "We will find a way to answer these problems if we work long and hard enough."

He also stressed service. It is important that we give high quality service on time, he said. "Quality is remembered long after price is forgotten," Rawls said.

New!

Allen-Bradley Bulletin 700 Type BR Relay with Easily Convertible Contacts

Bulletin 700 Type BR relay with four poles arranged for normally open contact operation.

Changeover made in seconds!

The contacts of the new Type BR relay can be arranged for either normally open or normally closed operation—and any changeover in the field can be made in seconds. A screwdriver is all that's needed.

Sets new standards in mechanical life and contact reliability!

This all-new addition to the A-B line of Bulletin 700 control relays has been designed to keep pace with the developments and progress in modern industry. The Type BR relay particularly satisfies the requirements of modern automatic machines where the control functions must be altered frequently to meet new and changing production requirements.

Quick and easy convertibility of the Type BR contacts from normally open to normally closed contacts —or vice versa—enables "on-the-spot" changes. Such built-in contact flexibility of the Type BR relays can be used to reduce relay inventories.

Exhaustive laboratory and field tests have indicated that the new A-B Bulletin 700 Type BR relays will establish new standards for the mechanical life and contact reliability for this general class of industrial relay.

Another great convenience for the user lies in the fact that a convertible auxiliary contact can be added to either or both sides of the Type BR relay—having full switching capacity—without disturbing the wiring or removing the relay. These auxiliary poles are easily mounted from the front.

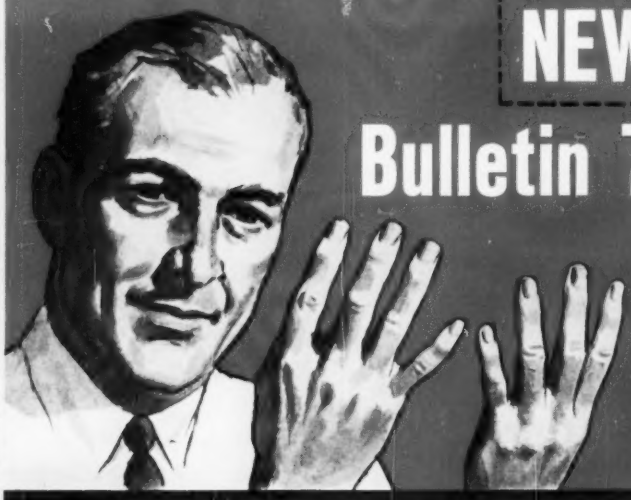
Of course, all Type BR relays have double break, silver alloy contacts that never need attention. The cast-plastic coil is impervious to the most severe atmospheric conditions.

Please write for full details on this latest addition to Allen-Bradley's line of *quality* industrial relays, today!

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

ALLEN-BRADLEY — **QUALITY MOTOR CONTROL**

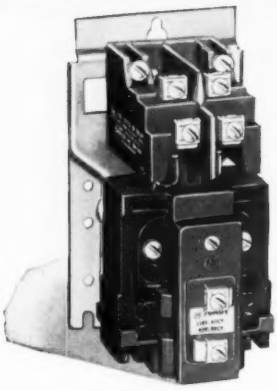
10-59-MR



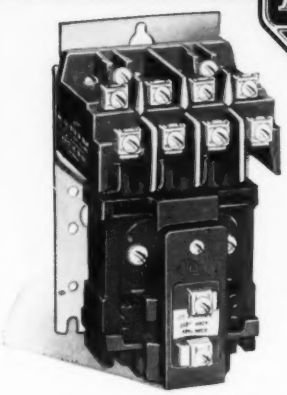
NEW Allen-Bradley Bulletin 700 Type BR RELAYS

are available with from two to eight poles— all with contacts *easily convertible* from N. O. to N. C.

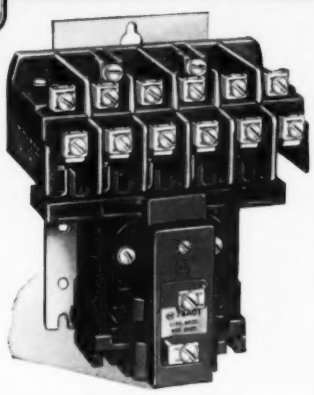
A-B QUALITY



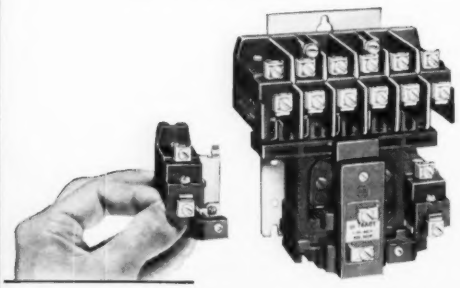
Two Pole Construction



Four Pole Construction



Six Pole Construction

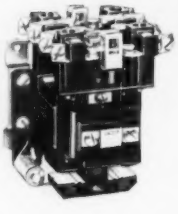


Two extra convertible poles can be easily added—in the field

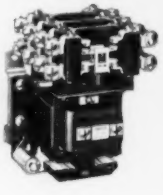
An auxiliary convertible contact pole—having full switching capacity—can be easily added to the left and right sides of the Type BR relays. These auxiliary poles are front-mounted and can be added without disturbing the wiring of the relay—and without removing the relay. All relays are designed to also accept stab connectors, and—all terminals are accessible from the front.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

Other popular Allen-Bradley industrial relays



Improved Bulletin 700 Type B
General purpose relay made with up to 8 poles.



Improved Bulletin 700 Type BX
Universal relay with both N.O. and N.C. contacts.

More mechanical life—greater contact reliability

10-59-MR

ALLEN-BRADLEY

Member of NEMA

Quality Motor Control

lectrical World Special Report

DECEMBER 1959

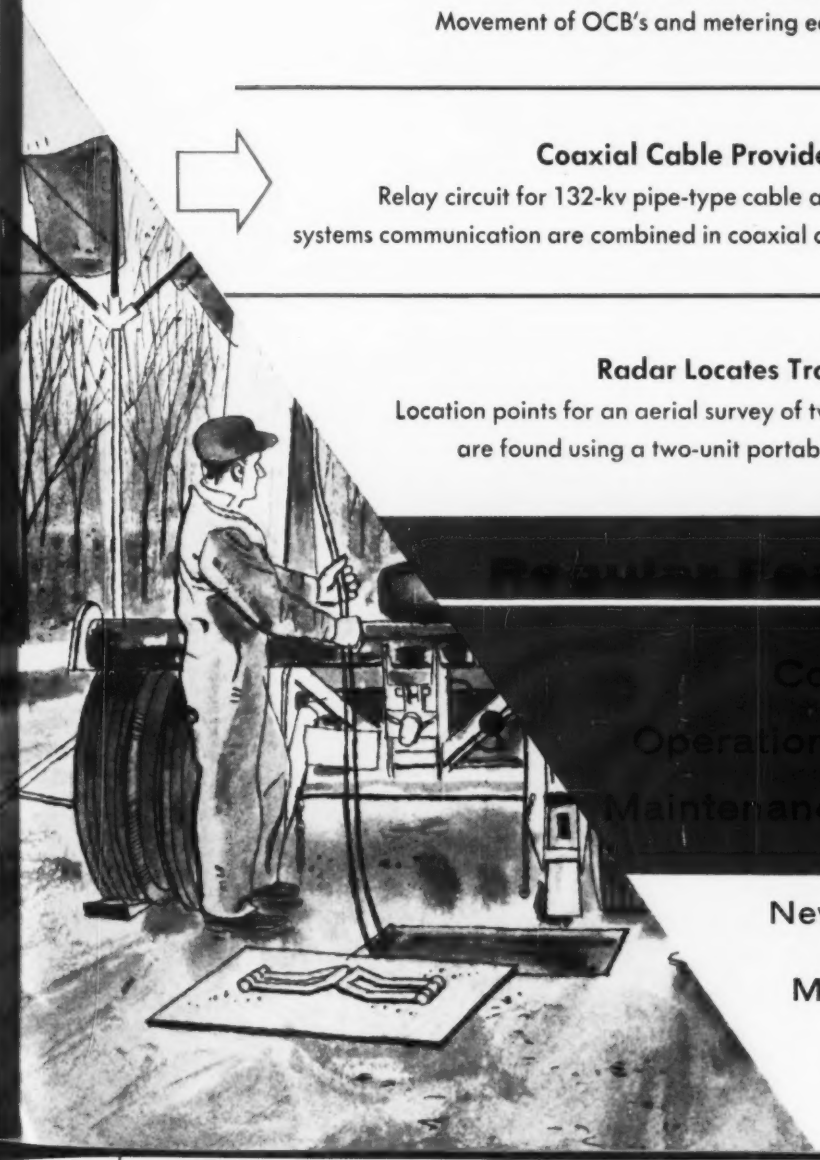
ELECTRIC utility methods

CONSTRUCTION • OPERATION • MAINTENANCE

Diagonal Strain Bus Saves Rebuilding Time
Circuits into 115-kv structure are relocated quickly. Movement of OCB's and metering equipment is avoided — p 78

Coaxial Cable Provides Relay Channel
Relay circuit for 132-kv pipe-type cable and channel for other systems communication are combined in coaxial cable-microwave link — p 75

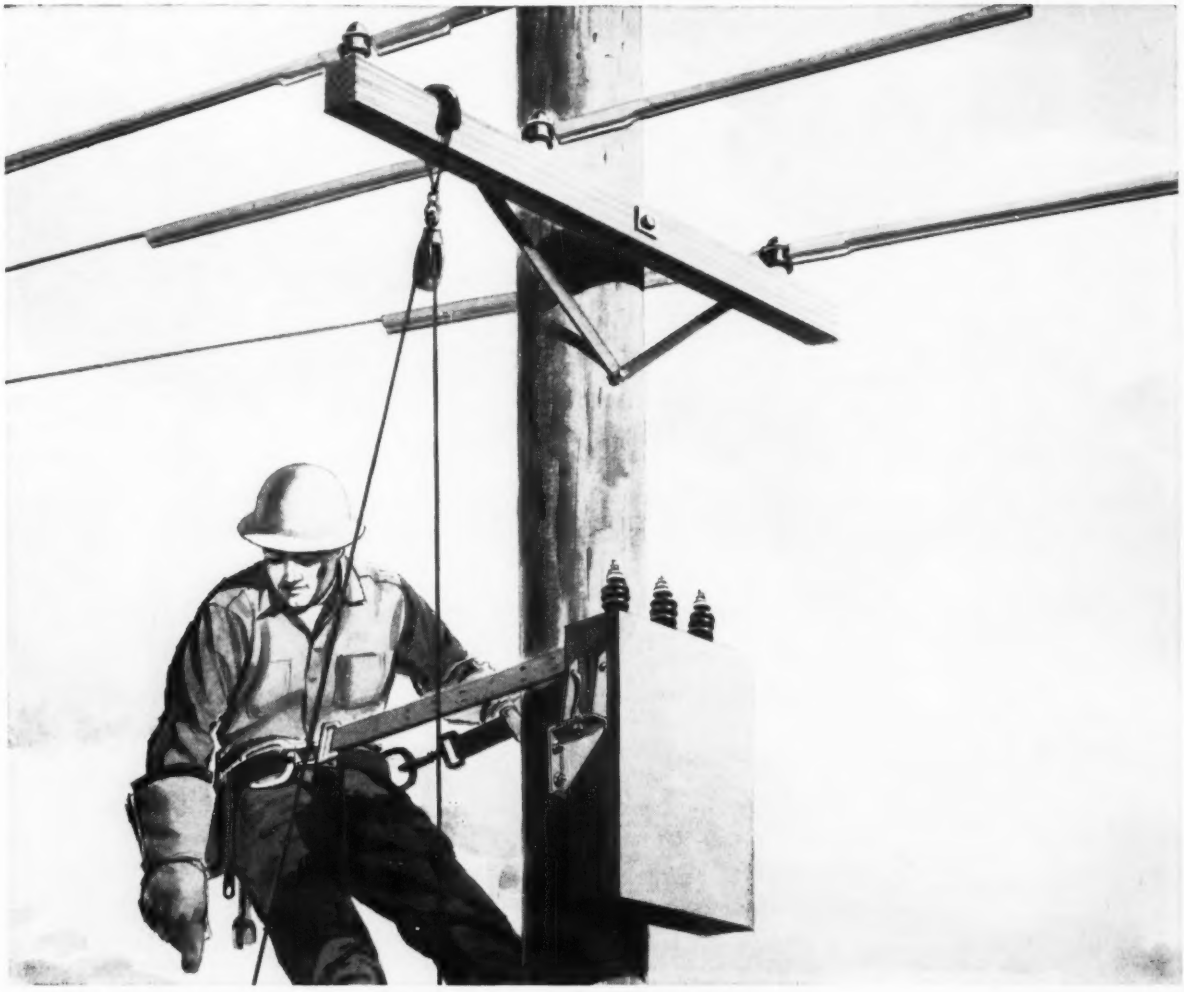
Radar Locates Transmission Route
Location points for an aerial survey of two transmission lines are found using a two-unit portable microwave system — p 82



Regular Features

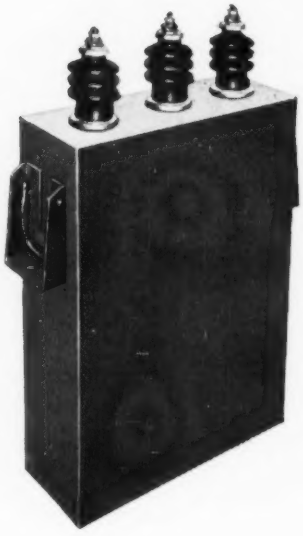
Construction — p 84
Operation & Testing — p 88
Maintenance & Repair — p 94

New Equipment — p 59
Safety — p 105
Manufacturers Literature — p 98



A New Bonus Value From Westinghouse Plowback of Earnings . . .

FIRST 100-KVAR, 3-PHASE CAPACITOR CUTS EQUIPMENT AND INSTALLATION COSTS



Available only from Westinghouse, this new development in 5-kv class capacitors provides a 3-phase installation in a single 100-kvar unit for applications previously requiring three separate single-phase capacitors. Not only does this equipment fill a kilovar gap, but it significantly reduces your investment in materials and installation.

Let us show you how this exclusive Westinghouse advance can mean Bonus Values beyond your specification, in economy and performance.

Ask your Westinghouse representative for details, or write: Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-60933

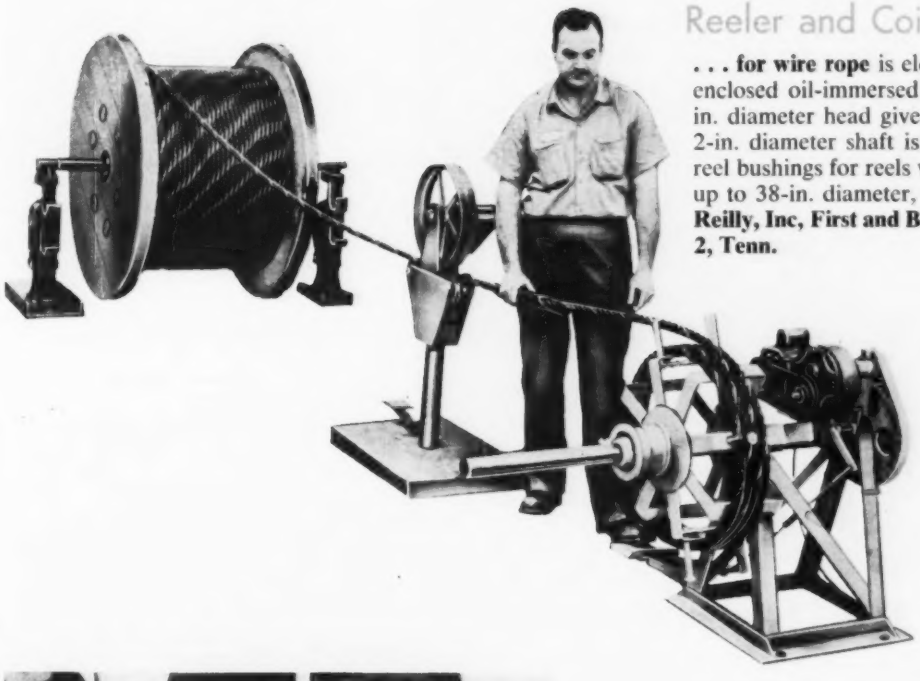
YOU CAN BE SURE...IF IT'S

Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL - DESI ARNAZ SHOWS" CBS-TV FRIDAYS

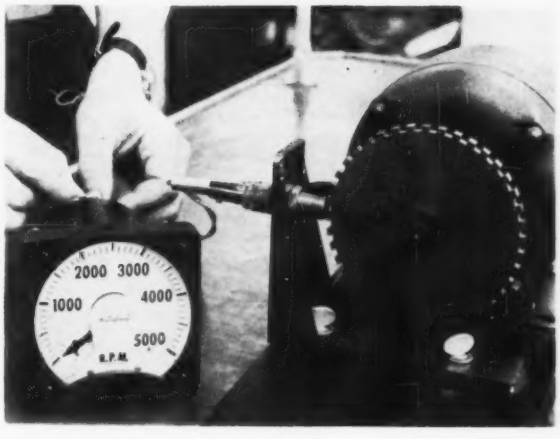
NEW EQUIPMENT

To obtain more information on these items, use code numbers indicated for each item when filling in Reader Service Card



Reeler and Coiler . . .

. . . for wire rope is electrically driven, with enclosed oil-immersed gear reducer. A 20-in. diameter head gives 89-fpm rope speed; 2-in. diameter shaft is for small reels; two-reel bushings for reels with 5-in. arbor holes, up to 38-in. diameter, 2,500 lb. **Sherman & Reilly, Inc, First and Broad Sts, Chattanooga 2, Tenn.** **(1)**



Speed-Indicating Instrument . . .

. . . requires no mechanical connection between it and the rotating shaft. For small steam or gas turbines, the Type K-241 instrument senses speed of the rotating part with an electromagnetic pickup, located near a gear or notched shaft. This signal is applied to an all-static circuit, which transforms the pulses to a dc millivolt signal. Output signal is proportional to pulse frequency. **Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.** **(2)**

Hydraulic Crane . . .

. . . mounts inside the body of a panel delivery truck. Design of the crane is such that it will handle bulky loads, such as a 55-gal steel drum. The crane is hand-operated and hydraulically powered, with a lifting capacity of 1,000 lb. When not in use, the crane folds inside the body in the space not normally used over the wheel well. **Ideal Crane Co, Box 516U, Wichita Falls, Texas.** **(3)**

Crapo GALVANIZED **STEEL STRAND**

TENSILE STRENGTH TESTS*

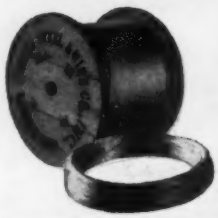
Laboratory Tests Assure HIGH DEPENDABLE QUALITY

When you specify a size and grade of CRAPO Galvanized Steel Strand you can be sure that it will meet or exceed the required standards. The wire used in its manufacture is laboratory tested in process, and before stranding, for tensile strength, ductility, elongation, gauge, and the quality and weight of the zinc coating. The finished strand is rechecked by the laboratory for tensile strength, lay, wire diameter, ductility and galvanizing.

This continuous testing is but one of the reasons why CRAPO galvanized steel strand enjoys a reputation second to none for long life and dependable performance. More than 50 years of specialized skill and experience in producing quality strand for the power and communication industries are your further assurance of its all 'round reliability.

Send for this New FREE Booklet

"The Story Behind CRAPO Galvanized Wire and Strand" illustrating and describing manufacturing and testing techniques. Ask for Booklet B-59!



AVAILABLE IN 3 COATINGS

For Guys, Messenger and Overhead Ground Wire

All sizes and grades of CRAPO Galvanized Steel Strand are available in A, B and C coatings. Class B coating is twice as thick as Class A coating; Class C is three times as thick as Class A.

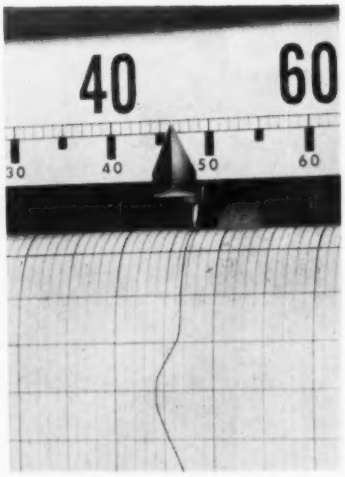
*Determines ductility of wire and adherent quality of galvanizing.

INDIANA STEEL & WIRE CO., INC.
Muncie, Indiana

Enclosure . . .

. . . permits use of pole-type transformers for underground residential service. It is constructed of heavy-gauge sheet steel and is equipped with doors on each end for ease of maintenance and installation. It is suitable for use with conventional transformers from 15 through 167 kva or CSP units 15 through 50 kva, 15 kv grounded-wye or below.

Moloney Electric Co, St. Louis 20, Mo. (4)



Ball-Point Pen . . .

. . . for recording and controlling instruments give excellent results at chart speeds from ¾ in. per hr to 240 in. per min, with instru-

(*Continued on page* 64)

ALL NEW!

Now! A new "Super Tape" for cold weather and heavy-duty uses

"SCOTCH" Brand Electrical Tape No. 88 is an all new plastic electrical tape 20% thicker than ordinary plastic tapes. It was specially developed to be a "super" tape for the toughest jobs—is super conformable under all climatic conditions. Even in cold weather, the extremely stable plastic backing retains easy handling properties and feel; the high-tack adhesive sticks at a touch and grips firmly. And the extra-tough flame retardant backing provides excellent resistance to abrasion, puncture, flame, acids, alkalies, oil, and weathering. For complete information, just clip and mail the coupon.

Electrical Products Division

"SCOTCH" AND THE PLAID DESIGN ARE REGISTERED TRADEMARKS OF 3M CO., ST. PAUL 6, MINN. EXPORT: 99 PARK AVE., NEW YORK 17. CANADA: LONDON, ONTARIO.

MINNESOTA MINING AND MANUFACTURING COMPANY
3M COMPANY

...WHERE RESEARCH IS THE KEY TO TOMORROW

3M Co., 900 Bush Ave.,
St. Paul 6, Minn., Dept. EBD-129

Please rush me complete information on your new cold-weather tape, "SCOTCH" Brand No. 88 Electrical Tape.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

NOW... Pennsylvania doubles the tank protection of Pole Star transformers and regulators with new V.I.P.

V.I.P. *pretreats tank surfaces to resist corrosion*

V.I.P. *prevents spread of rust if scratches occur in handling*

V.I.P. *provides extra-high resistance to moisture, alkali, acids*

V.I.P. *protects against incipient corrosion at edges, corners*

V.I.P. *produces high-gloss finish that long retains its luster*

This is the 5-Step V.I.P. process that provides all-weather, all-climate protection for Pole Star distribution transformers and regulators

The sketch at left illustrates the five-step V.I.P. Finish (vinyl with inner phosphate). Note that it is not just a new paint, but a complete metal-finishing process that assures all-climate, all-weather protection.

1. Shot-blasting with steel grit removes all scale, grease and dirt, and provides "toothage" for adhesion of the first coat to the steel surface.

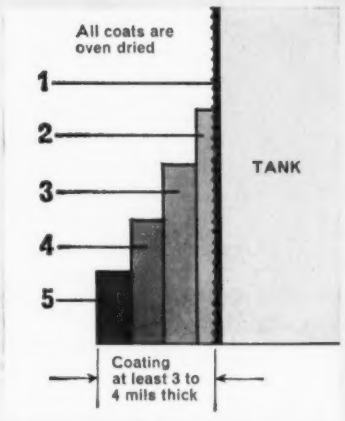
2. A combination chemical pretreatment and primer applied by the flow method simultaneously form a phosphate coat and thin organic film on the clean metal. This is the step that gives V.I.P. its ability to prevent the spread of corrosion, even if the metal is scraped bare in spots.

3. A tough vinyl combined with non-leafing aluminum form an almost impenetrable surface against moisture or moisture vapor. This coat is flowed on.

4. An alkyd-titanium paint (used successfully on Pole Star Transformers for many years) is flowed on to provide a heavy, uniform coverage.

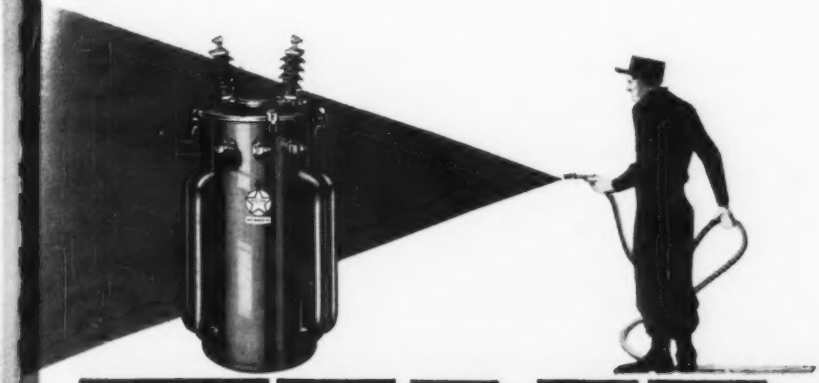
5. A final coat of blue-gray alkyd-titanium paint is sprayed on to assure a smooth finish with a maximum gloss. This, together with the preceding coat, forms a hard, elastic finish that resists weathering and does not fade or chalk too quickly.

Total thickness is three to four mils. All coats are oven dried at controlled temperatures.



Pennsylvania POLE STAR Distribution

CIRCLE 62 ON READER SERVICE CARD



FINISH*

*Vinyl with Inner Phosphate

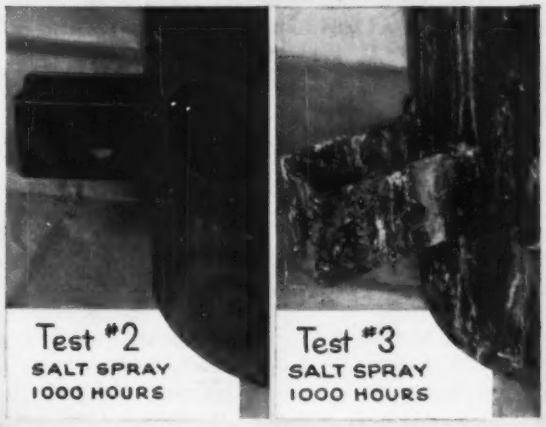
The new V.I.P. Finish for Pole Star Distribution Transformers and Regulators is *more* than a paint. Basically a *vinyl* finish with an *inner phosphate* coating, V.I.P. Finish gains its outstanding characteristics from careful preparation and pretreatment of the metal, followed by meticulously controlled application of the various coats.

A principal reason for the amazing weatherability of V.I.P. Finish is that it provides not only extra-high *primary* resistance to moisture, alkali and acids . . . but also sets up a secondary or insurance barrier that prevents the spread of corrosion if any bare metal becomes exposed, as in the case of accidental scratching. Such spots can be touched up with complete assurance that no underfilm corrosion will occur.

V.I.P. Finish is designed to save maintenance costs, even when transformers and regulators are exposed to the most highly corrosive atmospheres. Tests prove this. To take advantage of new V.I.P. Finish on your next distribution transformers or regulators, contact Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pennsylvania.

McGRAW EDISON

Here is just one of the dozens of tests that prove outstanding superiority of V.I.P. finish ... culmination of 15 years of research on protection of transformer tanks against water, ice, smog, salt spray and wind.



Salt Spray Tests

Temperature of cabinet: 95 F ±5 F. Salt solution: 20% (specific gravity of 1.126-1.158). Minimum duration of tests: 1000 hours. Ratings, as shown in the following table, were on the basis of "10" for perfect and "0" for complete failure.

RATINGS

System	Thickness (Mils)	Blistering	Underfilm Corrosion	Loss of Adhesion	Average
V.I.P. Finish	3-4	9.0	9.5	10.0	9.8
Ordinary Finish	2-3	0.0	4.0	5.0	3.0

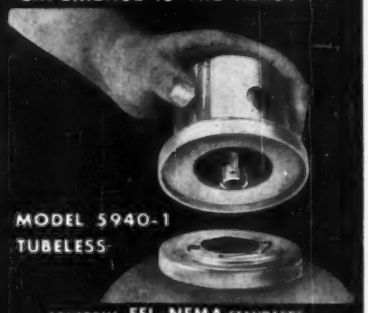
In this most rigorous of all tests, V.I.P. Finish (lefthand photograph) rated excellent on all counts. Note the amazing degree of effectiveness around lift lug and mounting bracket.

Ordinary transformer paint system (righthand photograph) scored *less than half* as well as V.I.P. Finish on all counts. Extreme corrosion was evident in some spots.

Transformers and Regulators

ALWAYS "UNDER CONTROL"

OVER 20 YEARS OF EXPERIENCE IS THE REASON!



MODEL 5940-1
TUBELESS

CONFORMS EEI-NEMA STANDARDS

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SunSwitch
DIVISION
RIPLEY COMPANY, INC. MIDDLETOWN, CONN.

CIRCLE 116 ON READER SERVICE CARD

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Save valuable Kw-hrs.

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Favorite of leading utilities for all low-resistance measurements on material tests, circuit breaker contacts, bus bar connections, cable joints.

MEASURES DOWN TO ONE MICROHM!

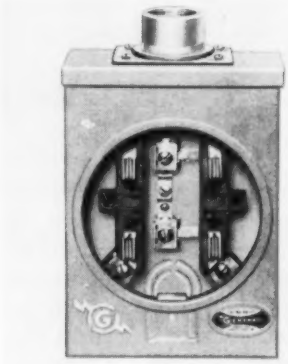
J.W. DICE CO. ENGLEWOOD, N.J.

Ball-Point Pen . . .

(*Continued from page 60*)

ment balancing speeds from 0.4 sec to 24 sec. Ink contained in the ball-point cartridge is available in several colors, and it is reproducible on standard office copying machines. An attachment is offered for installing the new pen on instruments which now have standard pens.

The Bristol Co, Waterbury 20, Conn. (5)



Meter Sockets . . .

. . . are available in 100-amp models with code gauge steel or code gauge aluminum enclosures. They feature angled lay-in type lugs with pressure plate. Approved for copper or aluminum wire, they will accommodate No. 6 through 4/0 sizes. A triple neutral, also provided with lay-in type lugs, makes possible the use of a combination of aluminum and copper wire up to 4/0.

General Switch Co, 45 Roebling St, Brooklyn 11, N. Y. (6)

Electrical Thermometer . . .

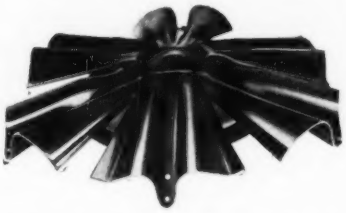
. . . makes quick determinations of surface and immersion temperatures. The Model T-1 operates through a handy probe ½ in. dia and 7 in. long connected to the instrument body by a thin, 5-conductor cable about 30 in.

long. The instrument has a range of from —20C to + 180C and is accurate to ± 1 to 1½ deg C. It is manufactured by Siemens & Halske A. G., Germany.

Ameresco, Inc, 7 Center Ave, Little Falls, N. J. (7)

Expanding Anchor . . .

. . . has rated holding power of 20,000 lb. The six-way fluke-type anchor has fluted blades made from a single piece of steel. Having an expanded area of 200 sq in., the anchor uses a 1-in.



rod. It has an unexpanded diameter of 10 in. and is coated with a black asphaltum paint. Anchor rod recovery is provided by a nut retainer at the base.

Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis. (8)

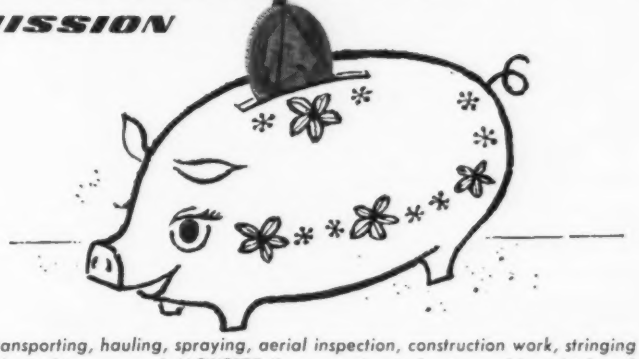
Strain Clamps . . .

. . . provide a taut, neat appearing assembly, free from radio and television interference. Used for slack-span dead end construction, the clamps feature a straight line design available in aluminum or galvanized, malleable iron, in five sizes for conductors ranging from

(*Continued on page 68*)

THE ALOUETTE SAVES REGULARLY...

ON EVERY MISSION



In transporting, hauling, spraying, aerial inspection, construction work, stringing wire, or at nearly any job, the turbine-powered ALOUETTE II — operating in heat or cold, at high or low altitudes — SAVES DOLLARS.

PROOF: Check these facts:

- ✻ *An Alouette sprayed an acre of brush along a remote powerline right of way in only 20 seconds for $7.26*
- ✻ *An Alouette transported four surveyors 20 miles to a 9,000 foot mountain landing at a total cost per man of $12.50*
- ✻ *An Alouette lifted and carried a 900 lb. seismographic drill rig 2 miles for $5.00*
- ✻ *An Alouette strung 8,000 feet of ⅜ inch steel cable in 1 hour and 40 minutes for $210.00*
- ✻ *An Alouette erected 30 telephone poles in 1 hour and 10 minutes at a total cost of $175.00*

Regardless of the task or climate . . . the low-maintenance Alouette brings ECONOMY to helicopter operations. Contact Republic's Helicopter Division for complete details on any of the above missions and on how the Alouette can help fill your needs.

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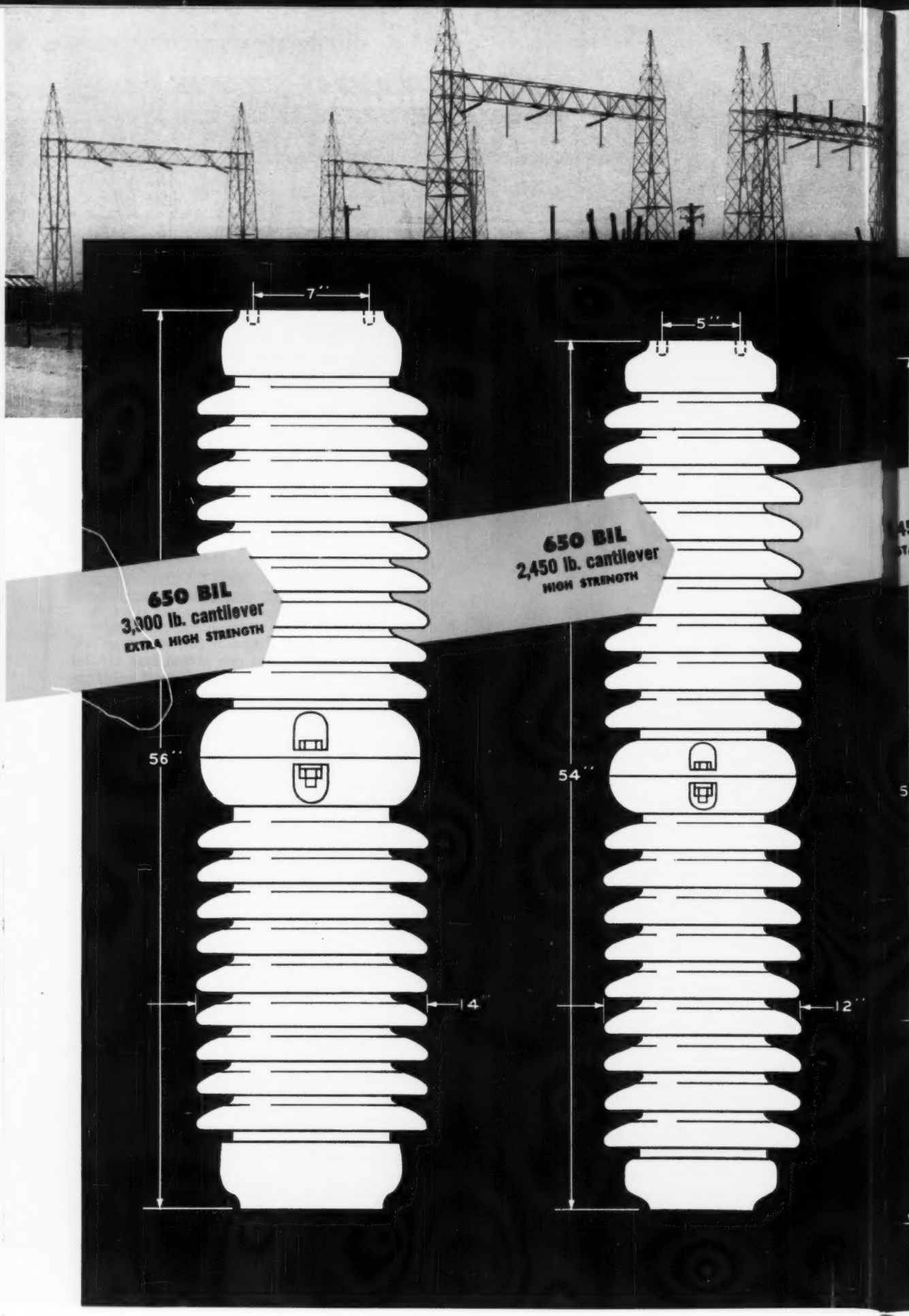
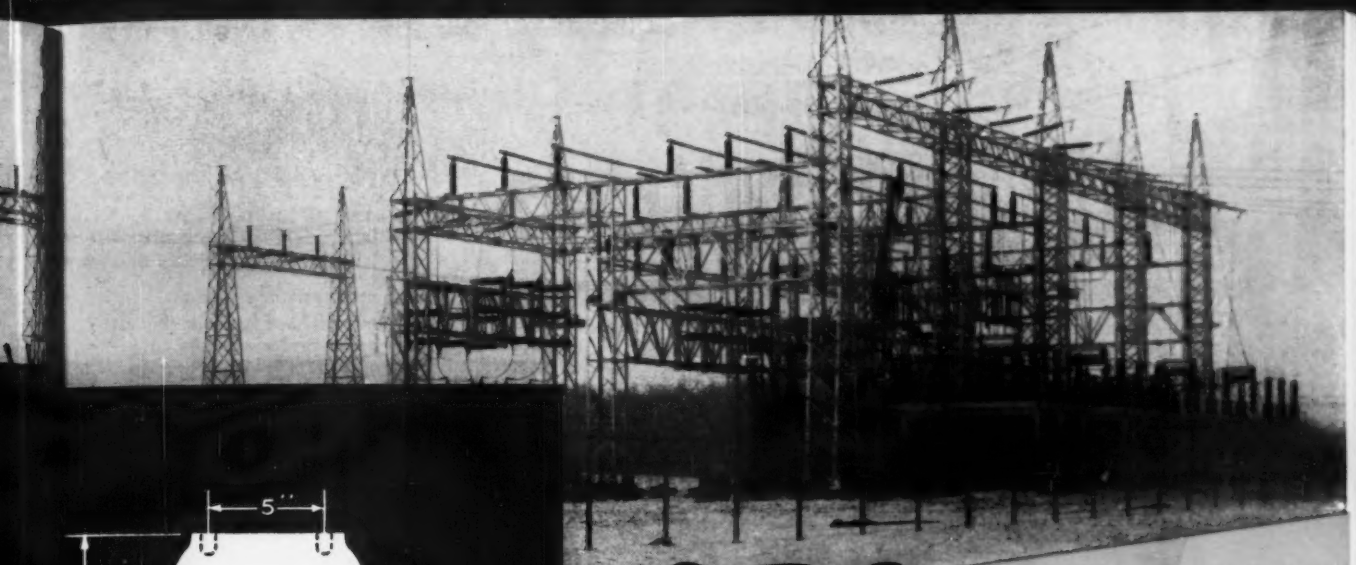
The Alouette is assembled, tested and distributed by:

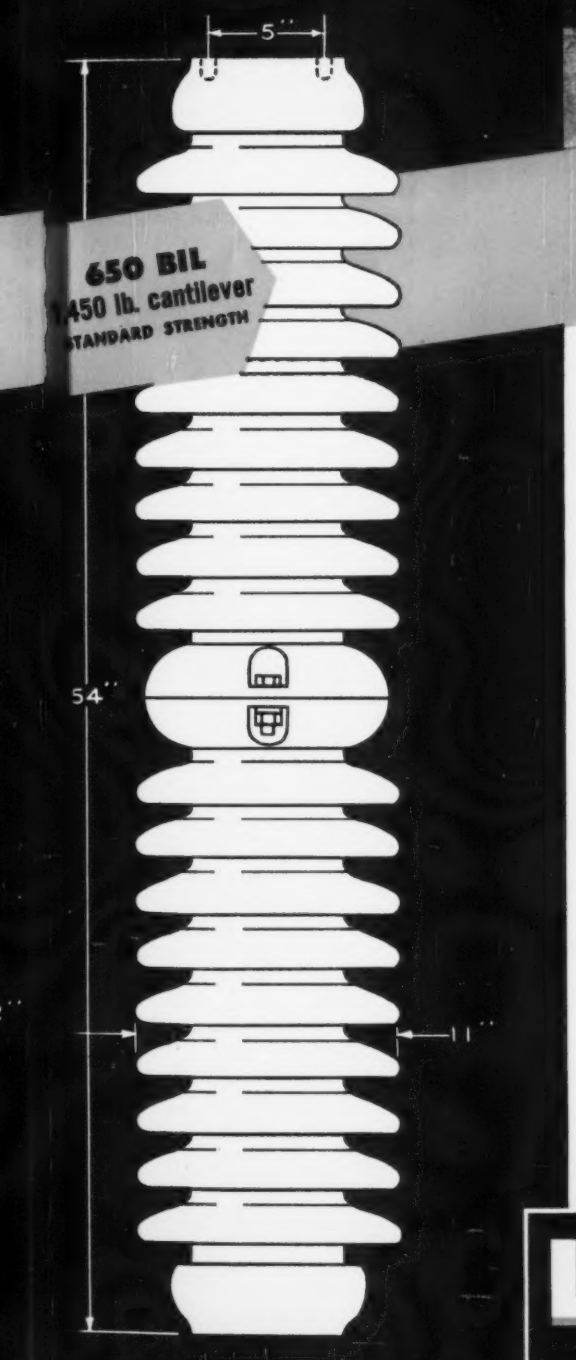
REPUBLIC AVIATION CORPORATION

HELICOPTER DIVISION

Farmingdale, Long Island, N. Y.


7"
650 BIL
3,900 lb. cantilever
EXTRA HIGH STRENGTH
56"
4"
5"
650 BIL
2,450 lb. cantilever
HIGH STRENGTH
54"
12"





650 BIL

LAPP STATION POSTS

the station insulators specifically designed for 138 kv service

Use of Lapp Station Posts rated at 650 BIL gives designers of 138 kv systems their first chance for most efficient balance of structure cost and electrical characteristics. As compared with use of 161 kv station insulators (until now the only "safe" construction for 138 kv) these new units provide greater strength and rigidity with less weight . . . permit more flexible, more compact station design, with smaller air break switches . . . are suited to horizontal mounting . . . allow wider spacing of bus supports under short circuit forces . . . all at lower costs for insulators *and* structure.

For best performance, highest reliability, lowest cost, design 138 kv stations on Lapp 650 BIL Station Posts.

Lapp Insulator Co., Inc., Le Roy, New York.

Lapp

CIRCLE 67 ON READER SERVICE CARD

Instrument Switches

A CATALOG OF

Low-cost → *Dependable*

ROTARY MULTIPOLE SWITCHES for INSTRUMENT, TRANSFER, and SELECTOR SERVICE.

ESCO instrument switches permit control of complex circuits with a single compact switch instead of separate switches.

This catalog covers ESCO Type P snap-acting switches, with up to four selector positions, handling 10 amperes at 120 volts a-c, 5 amperes at 240 volts a-c, 3 amperes at 450 volts a-c or 5 amperes at 125 volts d-c, 3 amperes at 250 volts d-c.

The catalog also lists ESCO JR detent-action switches with up to eight selector positions, handling 10 amperes at 125 volts a-c or 5 amperes at 125 volts d-c.

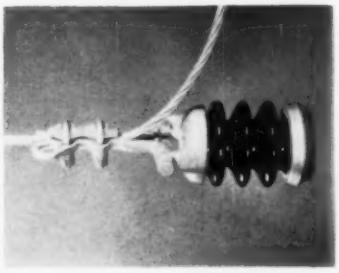
The basic structure of ESCO rotary switches provides for extreme flexibility in design. Tell us your circuit arrangements and the sequences you need, and we will recommend the correct switch for your use.

Write TODAY for your copy of this catalog.

ESCO *of* WEYMOUTH
ELECTRO SWITCH CORPORATION
Weymouth 88, Massachusetts

Strain Clamps . . .

(*Continued from page* 65)



0.16 to 1.56 in. The clamps are used with standard Lapp Clamp Top line posts and attach to the cap on the insulator with a single capscrew. Mechanically, the clamp and insulator assembly has a 5,000-lb tension rating.
Lapp Insulator Co, Inc, Le Roy, N. Y. (9)

Zippertubing . . .

. . . has conveniently spaced perforations to provide branch-outs for wire harness assemblies. The perforated material may be used as a raceway instead of clamps, ties or lacing. It also allows drainage of moisture condensation, prolonging wire life.
Zippertubing Co, 752 S San Pedro St, Los Angeles, Calif. (10)

Stringing Block . . .

. . . features high strength and minimum weight. A permanently bonded Type GNA Neoprene Sheave Lining gives protection to both sheave and conductor. A

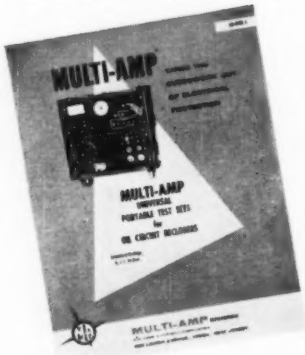
(*Continued on page* 70)

Long bow, utility pole or railroad tie—whatever the product—serviceability largely hinges on the method of preservation. Equally critical is the quality of the stock you start with...the raw material. Your wood investment is protected on two counts when you specify AMCRECO pressure treated products. First, a time-tested treating technique, confirmed by major industrial users coast to coast. Second, a 1,500,000-acre timber supply...vast and versatile enough to assure you highest quality grades regardless of your requirements or delivery deadline.

AMERICAN CREOSOTING CORPORATION AMCRECO Louisville 2, Kentucky

Subsidiary of Union Bag-Camp Paper Corporation

Purchasing Men... NOTE:



THIS NEW CATALOG WILL HELP TO KEEP YOU WELL INFORMED ON THE LATEST TEST EQUIPMENT FOR CHECKING ALL CURRENT ACTUATED PROTECTIVE DEVICES AND WILL PROVIDE INCREASED COORDINATION BETWEEN ENGINEERING AND PURCHASING ACTIVITIES.

WRITE TODAY for this valuable informative literature. It would be helpful for specific members in your engineering department to have a copy of the particular catalog sections in which they are interested. The sections will include TESTERS for Relays, Circuit Breakers, Oil Circuit Reclosers, also Power Supply Units, Load Boxes, and custom built units.

MULTI-AMP DIVISION
MULTI-AMP ELECTRONIC CORPORATION
465 LEHIGH AVENUE, UNION, NEW JERSEY

Stringing Block . . .

(*Continued from page* 68)

conductor guard is an integral part of the side frame and prevents fouling of pulling line or conductor. Ultimate strength of the Series 78 Block is 35,000 lb. Sizes through 28 in. for conductor to 1,780 MCM are available. **Sherman and Reilly, Inc, First and Broad Sts, Chattanooga 2, Tenn. (11)**

Battery Charger . . .

. . . is built into the battery container. Known as the AutoReg AR-2, the unit charges 6-cell, 12-v motive power batteries overnight. The charger is a single-phase, constant dc voltage, silicon rectifier type. It plugs into any standard 15-amp, 115-v, 60-cps convenience outlet.
C & D Batteries, Washington and Cherry Sts, Conshohocken, Pa. (12)

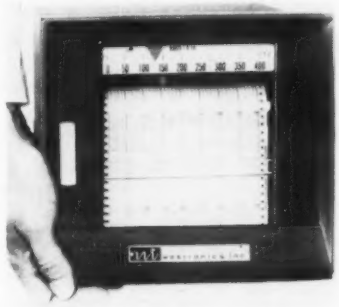
Electrical Tapes . . .

. . . have been recently announced. "Scotch" brand No. X-1099 has a backing of fully-cured, flexible, 100% solids epoxy resin reinforced with a 0.002-in. glass cloth. It has high resistance to cold flow, good conformability, high electric strength and the physical strength of glass cloth at Class F operating temperatures. "Scotch"

brand No. X-1112 has a TFE Fluorcarbon impregnated glass cloth backing which is coated with a thermosetting silicone adhesive. It provides added strength and holding power to perform heavy duty functions.
Minnesota Mining & Mfg Co, 900 Bush Ave, St. Paul 6, Minn. (13)

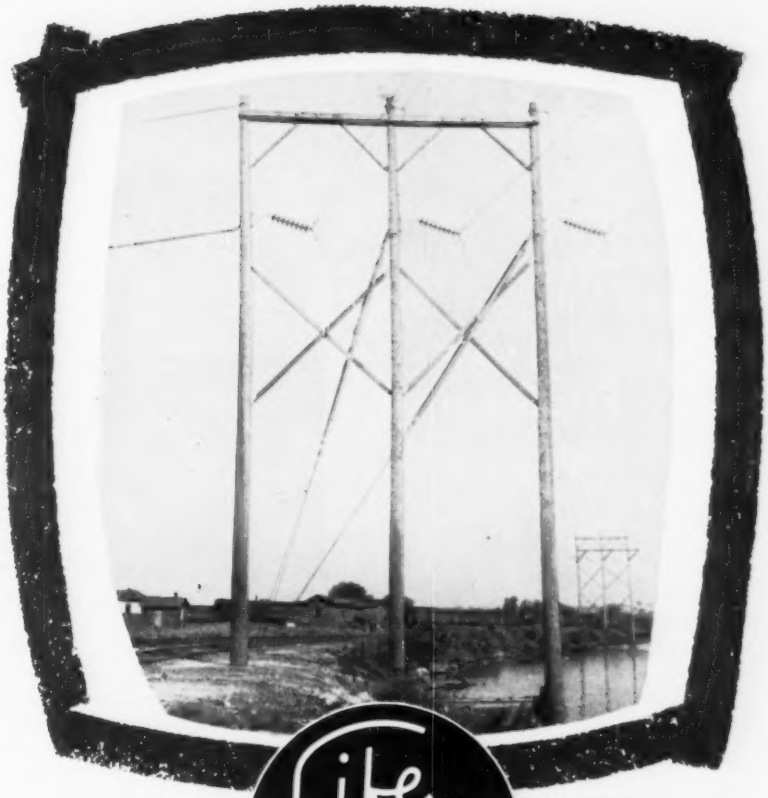
Two-Way Radio . . .

. . . weighs only 8 lb and is less than 12 in. in length. Known as the Portacom, the unit includes a handset, fm receiver, one or two-channel fm transmitter, demountable whip antenna, battery pack and carrying strap.
Allen B. Du Mont Laboratories, Inc, Clifton, N. J. (14)



Multipoint Recorder...

. . . allows the plotting of twelve variables on a 5-in. calibrated chart width by scanning and sampling. The Model M5 Miniature Multipoint Recorder is available with 12 points and a standard printing rate of 5 sec per point.
Westronics, Inc, 3605 McCart St, Fort Worth, Tex. (15)

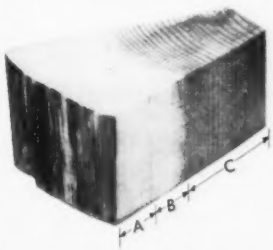


You can be sure when you install Life-Span Western Red Cedar Poles!

. . . even where the most severe decay conditions exist

LIFE-SPAN'S thermal top-to-butt treatment permeates the ENTIRE sapwood . . . assuring longer pole-line service regardless of adverse installation or weather conditions. Besides being completely immune to decay, LIFE-SPAN Poles are clean, safe to climb and are carefully selected for uniformity and quality.

Want added years of pole-line service at far less per annum costs? Specify LIFE-SPAN Western Red Cedar Poles when you buy.



Actual laboratory tests **prove . . .** pentachlorophenal permeates both inner sapwood and outer sapwood the LIFE-SPAN way, making it impossible for the sapwood to decay under the most severe conditions. The above is a section taken from a Western Red Cedar pole after **years** of actual pole-line service under adverse conditions. It shows **(A)** the outer sapwood, **(B)** the inner sapwood and **(C)** the heart wood—all in perfect condition.

PAGE & HILL, Inc.
Minneapolis 3, Minnesota

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For more than a century Klein has been the leader in designing and producing tools and equipment to serve the exacting needs of the utility field.

Today, wherever power lines or communication lines are strung, Klein tools and equipment are in greater demand than ever, assuring safer, speedier line construction and operation.

WRITE FOR FREE TOOL GUIDE
A free copy of the new Klein Pocket Tool Guide will be sent on request.

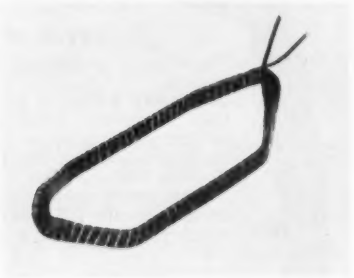
ASK YOUR SUPPLIER
Foreign Distributor: International Standard Electric Corp., New York

Mathias KLEIN & Sons
Established 1857 Chicago, Ill., U.S.A.
7200 W. CORMICH ROAD • CHICAGO 45, ILLINOIS

Hydraulic Derrick . . .

. . . is mounted to the left rear of the truck. Known as the "CD Derrick," the unit is designed to mount to standard and existing utility bodies. A hydraulic jack behind the right rear wheel permits lifting up to 8,000 lb. A maximum sheave height of 28 ft is provided. A 4-ft hydraulically-adjusted stinger coupled with a 3-ft head extension gives the derrick a versatile radius. **Tel-E-Lect Products, Inc, 10001 Minnetonka Blvd, Minneapolis 26, Minn. (16)**

Insulating Tape . . .



. . . for form-wound motor coils is made of self-bonding unsupported silicone rubber. Known as Permacel PSR-2800 Triangular Guide Line Tape, the material can be half lapped around complex shaped coils and wires to give a smooth build-up. The Class H insulator has excellent chemical, dielectric and physical stability from —130F to 500F. **Permacel, New Brunswick, N. J. (17)**

Fire Extinguishers . . .

. . . in 200 and 400-lb pressurized dry chemical hose rack models are now available. The units are Underwriters' Laboratories approved for use on flammable liquid, gas and electrical fires. They can be wall, floor or truck mounted. The nozzle discharges a pattern delivering an optimum extinguishing ability for 40 ft. **Walter Kidde & Co, Inc, 675 Main St, Belleville, N. J. (18)**

GET GOLD SEAL RUBBER TAPE *for easy handling and instant fusing*

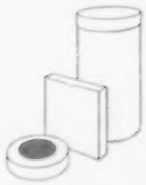
Here's the tape for high voltage insulation! Easy to work with, Gold Seal Rubber Tape fuses together instantly, provides long-life insulation protection. With its high dielectric strength and ability to conform to irregular shapes, Gold Seal makes a perfect insulating splice. Jenkins Bros., Rubber Division, 100 Park Avenue, New York 17.

Gold Seal Tape

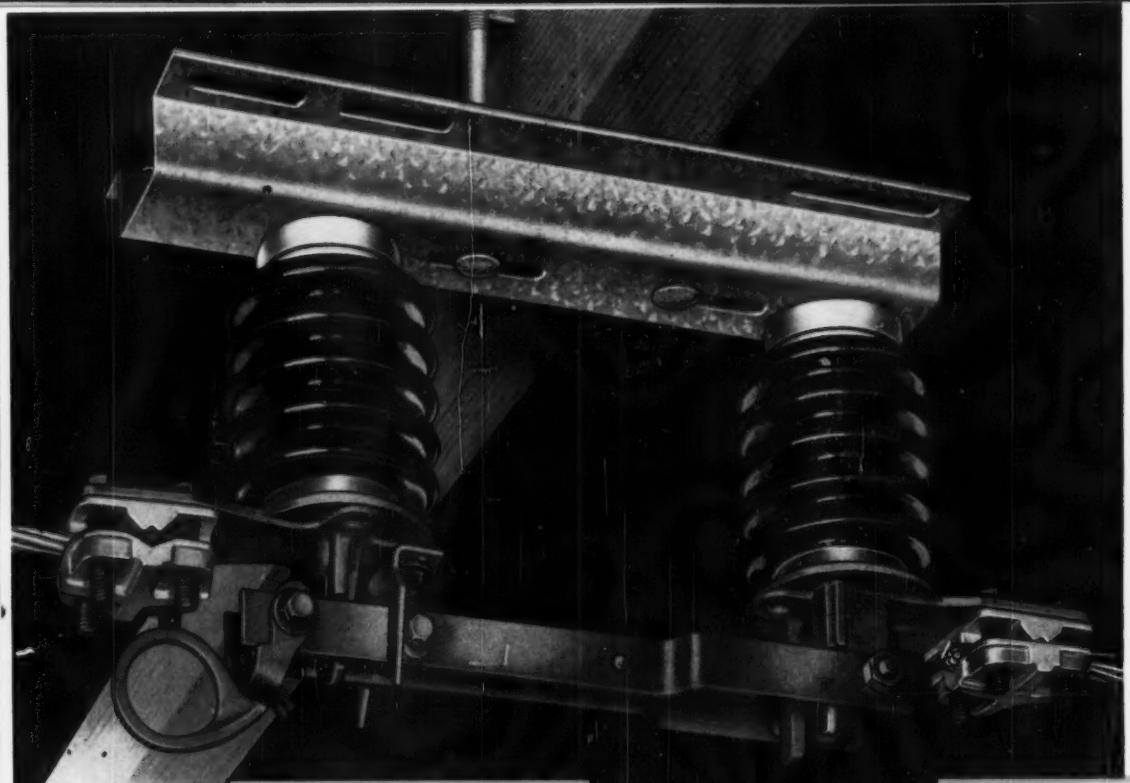
FOR EVERY APPLICATION

Gold Seal Friction • RUBBER • Plastic Tapes . . .

Commercial and Specification Grades



In 10-roll containers or single rolls. Each roll sealed in cellophane, stays fresh.



Write today for the Kearney Catalog Section 6, on Hook Operated Disconnects

NOW

Type MC
400 and 600 amperes

Type MCL—200 and 400 amperes. Note hooks for use of hot-stick load interrupting device.

peak performance
at lowest cost with

KEARNEY

hook operated DISCONNECTS

Sturdy, simplified construction of Kearney Center Bolt type Disconnect Switches offers field-proved performance with substantial cost savings. Current-carrying parts comply with all NEMA standards for heat rise and surge capacity. One-piece casting of terminal pads and contacts minimizes transfer points, reduces heat. Blades and blade lock are exceptionally strong and rigid. See and test this superior equipment—discover how *you* can get maximum performance at minimum cost.

- **Blade withstands 80 lbs. thrust at 90° to pull ring without distorting.**
- **90° blade stop in open position checks blade from falling free.**
- **Positive latch and pry-out prevent galling.**
- **Hinges carry no current, permit best mechanical design.**

JAMES R. KEARNEY CORPORATION • 4224-42 Clayton Avenue • St. Louis 10, Mo.

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Specify Kearney Products

Plants at: **ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH & CLARINDA, IOWA • GUELPH, ONTARIO, CANADA**

CIRCLE 74 ON READER SERVICE CARD

CEI Installs Coaxial Cable for Relay Channel

Coaxial circuit and microwave provide channel for relay protection of 132-kv pipe-type cables

E. W. DOWNER, Senior Engineer, Plant and Substation Engineering Dept, Cleveland Electric Illuminating Co, Cleveland, Ohio

Coaxial cable in an unused duct line, plus a microwave link, provides a carrier-current channel for the protection of two 132-kv pipe-type cable circuits on the Cleveland Electric Illuminating Co system. The coaxial cable system also provides a communication link for telemetering, supervisory control, automatic load dispatch, and telephone circuits between three stations and the main office. The decision to use coaxial cable followed an investigation for a unique communication medium made necessary by the choice of permissive overreaching protective relaying for the pipe-type cables. These cables are important bulk power circuits between the company's Lake Shore Plant and Hamilton and Jennings Substations.

Airline distances between Lake Shore and Hamilton and between Hamilton and Jennings are 2.8 miles and 3.1 miles, respectively. Past studies of communication facilities for similar protective relaying on other circuits had already ruled out leased lines because of insufficient speed and reliability. Pilot wires were considered, but they could not provide for other communication uses also contemplated between these stations. Microwave channels, used extensively in the CEI system for similar relaying applications, appeared suitable in this design. Unfortunately, use of microwave was discouraged by possible path obstruction from future buildings in the downtown area.

Coaxial cable for carrying protective relaying signals and other utility communications had been studied earlier for use on 132-kv lines serving customers. Results showed that the economical break-even point of a coaxial cable, as compared with microwave, would be for a distance of about 7 miles. Use of coaxial cable required that space be available on nearby poles, on the 132-kv structures themselves, or in unused duct lines.

It appeared that coaxial cable had possibilities for

SUBCARRIER CHANNELS at the coaxial cable terminal are standard relaying equipment. Two power frequency filters (inset photo) isolate power fault currents from channel equipment; band pass filters interconnect the coaxial cable link to the microwave system

use in the protection of the pipe-type cables. Between Lake Shore and Hamilton a route was planned using a vacant duct in a group of ducts carrying 11-kv and 4.6-kv cables. This circuit, covering a distance of 18,182 ft, provided the first link. However, no duct lines were available between Hamilton and Jennings Substations.

As an alternate means, it was found that a microwave path could be established from the top floor (300 ft above ground) of the Illuminating Building (main office) to the Jennings Substation. This path would be relatively secure from future tall building obstructions. Also, a duct line was available from Hamilton Substation to the main office, a distance of 6,025 ft.

Thus, it was possible to transmit relaying as well as other information by coaxial cable between Hamilton Substation and the main office, completing the communication circuit over microwave to Jennings Substation. By repeating through the main office, telemetering, supervisory control, automatic load dispatch, and telephone circuits between the three stations and the office could be established. In addition this scheme would provide a tie with the main microwave system.

Fault Current and Noise Were Problems

Several technical problems were associated with the use of coaxial cable between 132-kv station. The first concern was fault current magnitudes to be expected along the cable sheath, as well as the inner conductor, during a phase-to-ground fault at the two stations tied by the cable. Next, the type of noise to be expected during the fault had to be determined, because a high magnitude of noise could block tripping when a trip signal was being sent.

To meet these problems, a 70-ohm, 0.435-in. OD coaxial cable was selected. This cable consists of a solid aluminum sheath with a polyethylene jacket and an inner copper conductor suspended in a polyethylene and nitrogen foam. This cable requires no pressurizing, yet has characteristics approaching those of some gas-filled types. The polyethylene jacket provides electrolysis protection only and is not intended for high-voltage stresses. A characteristic impedance of 70 ohms was chosen to match the microwave terminations correctly.

Relaying subcarrier equipment selected for the relaying terminal facilities is the standard relaying subcarrier used for microwave relaying and operates in the 400-kc range. Laboratory tests confirmed that the transmitters together with the receivers would work through the expected cable attenuations with sufficient signal margin. They also would provide for optimum security against false operation.

Calculations for expected fault current on the coaxial cable indicated a 60-amp maximum until the fault cleared. This presented no serious problem for the cable. However, the current magnitudes in the sheath and inner conductor would be unbalanced. This is due to the sheath being at solid station ground potential while the inner conductor would show a potential to ground through terminating resistors at the cable ends in series with station grounds.

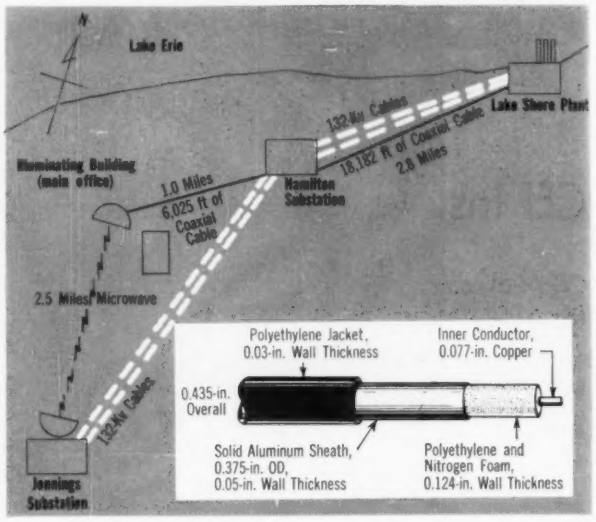


FIG 1—COAXIAL CABLE CIRCUITS run in unused duct lines from power plant to substations. Microwave provides a link where no duct line was available

Potential to be expected across the terminals of the transmitters and receivers would be several hundred volts at 60 cycles. Despite the fact that the filters on the carrier equipment are designed to pass only frequencies in the 400-kc range, magnitudes of 60-cycle voltage during a fault could damage the equipment or block its operation.

Thus, a special high-pass filter, designed by company engineers, is used at cable terminals to attenuate the 60-cycle and associated high magnitude harmonics. This filter will handle the power current magnitudes expected and reduce the terminal voltages to a fraction of a volt during a power fault. The filter offers negligible attenuation to the carrier signals being transmitted.

Relaying channel routing between the three stations is shown in Fig 1. Voice and other channels, and interconnections with the main microwave system, are not shown. Two coaxial cables are used in this installation, one for transmissions eastward and the other for transmissions westward. It is possible that one cable would serve for both directions provided that channel frequencies were properly staggered. However, this will introduce the problems of "near-end crosstalk" and band-pass amplifiers associated with a single-cable circuit. Future installations probably will be of single-cable design.

One Link Now in Operation

A functional block diagram of the coaxial cable system showing the relaying channels, repeating amplifiers and filters, is given in Fig 2. In addition to the relaying channels, the voice, supervisory control, and telemetering circuits are in service, with near future plans covering automatic dispatch facilities. The interconnection with the microwave system is at radio frequency levels to avoid problems associated with modulating and demodulating to audio or dc pulses to accomplish the connection.

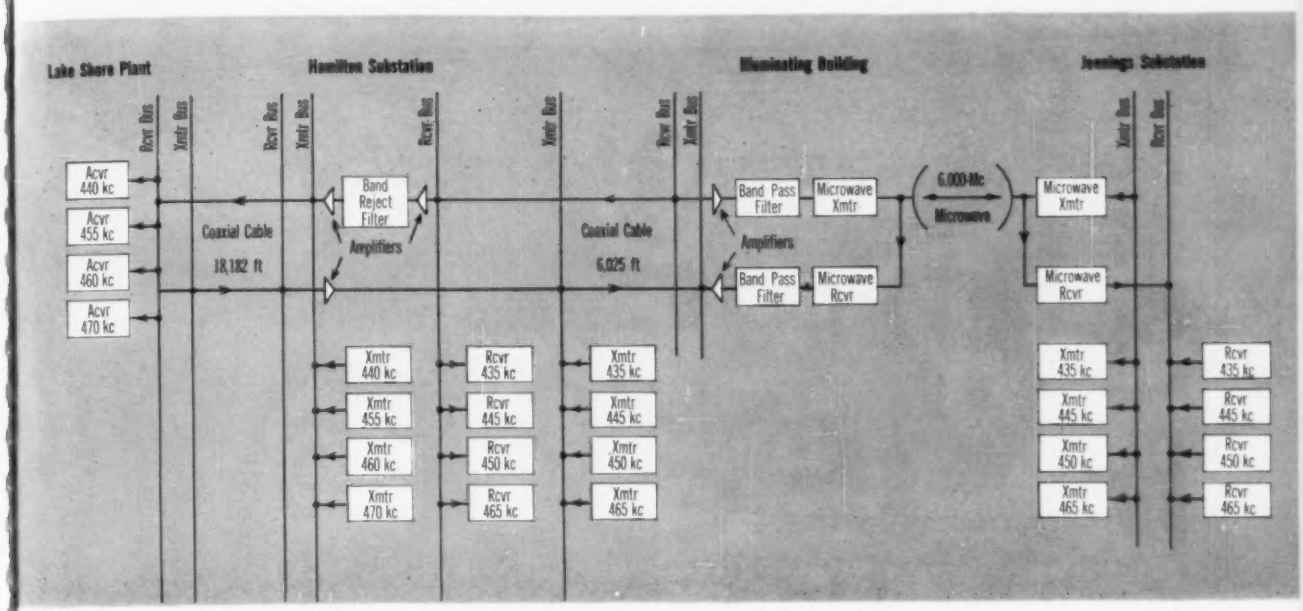


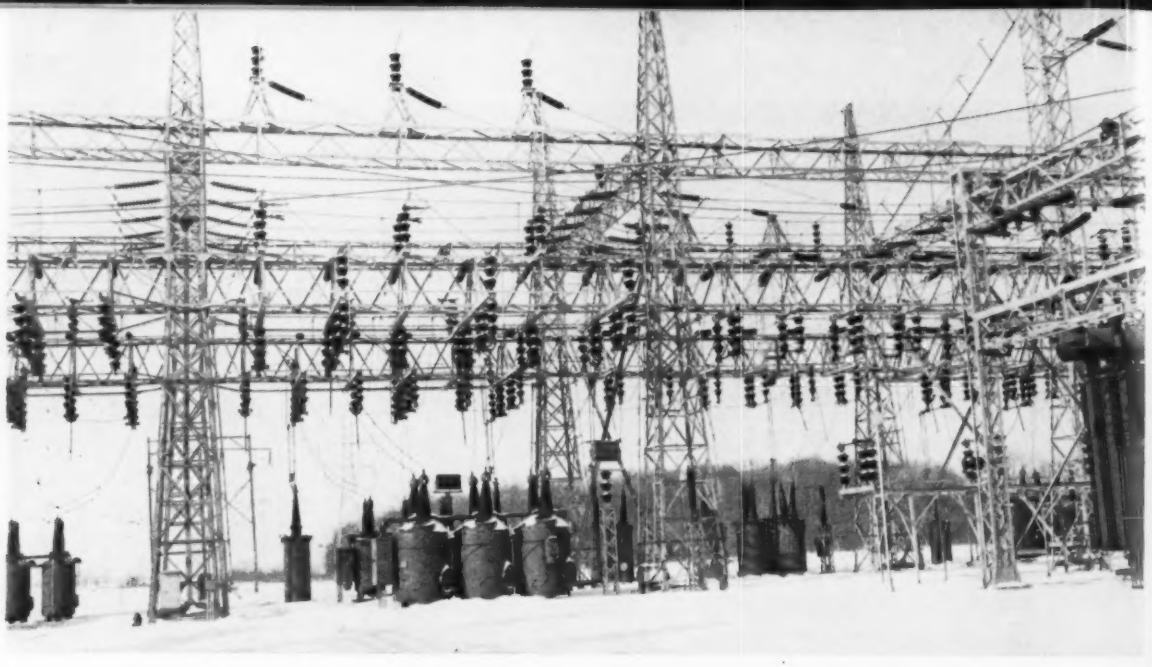
FIG 2—RELAYING CHANNELS and voice, supervisory control and telemetering circuits now are in service over the coaxial cable-microwave system. Interconnection of the coaxial cable with the microwave system is at radio frequency levels to avoid problems associated with modulating and demodulating to audio or dc pulses

Power supply for the terminal equipment at Lake Shore is the station service, which has a history of high reliability. At Hamilton a 1.5-kw dc-to-ac rotary converter with automatic standby is used, operating from the station battery. At the main office and Jennings, microwave power supplies consist of ac motor-ac generator units with attached high-inertia flywheels and standby gas engines.

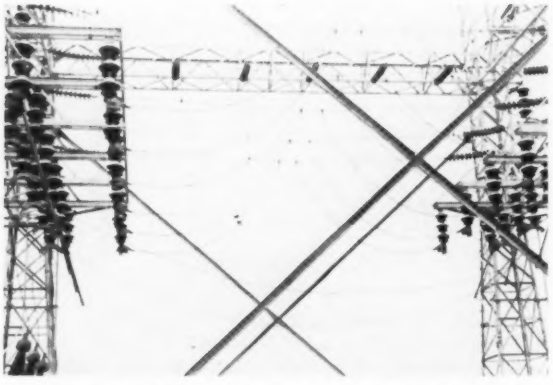
The Hamilton-to-Lake Shore link has been in operation for over eight months. To date, there have been no power faults on the pipetype cables; however, several cable faults have occurred on circuits running in ducts adjacent to the coaxial cables. For the same period there have been no false signals or any channel failures.

The Hamilton-to-main office link together with the associated microwave to Jennings Substation is scheduled for operation this month. Repeater amplifiers are employed at Hamilton Substation as well as at the junction of the cable and microwave at the main office. Amplifiers at Hamilton are principally for isolating purposes and for overcoming the filter loss in the Lake Shore direction. Filters are employed for drop and insert purposes and for eliminating unwanted signals at the junction of the cable and microwave system.

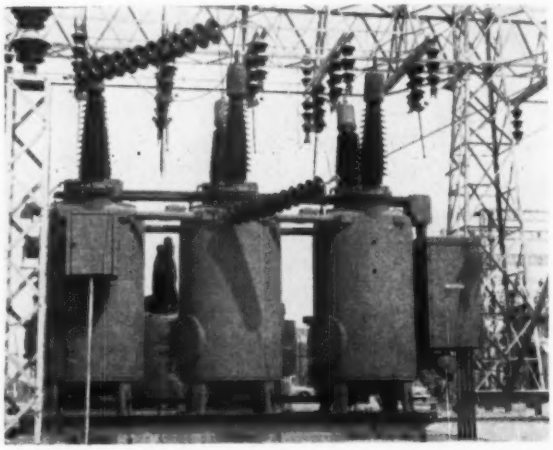
INSTALLATION OF COAXIAL CABLE was made with a power-driven cable trailer. Each cable section averaged about 800 ft, with a total of 29 splices per circuit. Cables were bonded at 17 points and were pulled through manholes to minimized splicing of the cable



Diagonal Strain Bus Speeds Station Changes



JUMPERS ACROSS THE YARD provided a Michigan City-South Bend circuit complete with metering and relaying



TEMPORARY CONNECTION was made by "running the 138 kv on the ground" with minimum clearance of 8 ft

JOHN F. PHELAN, Division Chief Load Dispatcher, Indiana & Michigan Electric Co, South Bend, Ind.

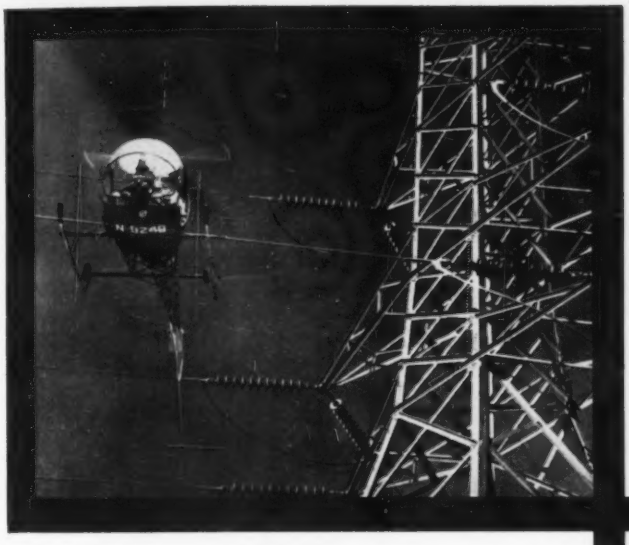
Installing a strain bus diagonally across a substation saved almost $2,000 for Indiana & Michigan Electric Co. Additionally, the job was done in three working days and outages were cut considerably.

When the Olive 345/138-kv substation was added to the I&M system, changes had to be made in the 138-kv network at the substation in New Carlisle, Ind. Problems of moving bulky 138-kv oil circuit breakers and heavy metering transformers arose.

It was noted in the old station layout that one oil circuit breaker was connected exactly as it would be used after revisions, except that it would need to be moved one bay north and to the other side of the structure. It was apparent that a diagonal connection across the station would eliminate relocating a considerable amount of equipment and associated construction changes. Investigation showed that clearances were adequate and connections could be made this way. The only materials needed would be minor steel details and longer strain bus conductors. The old station layout, a conventionally-revised layout, and the new layout selected are shown on page 80.

Steps saved using the new layout were:

1. Removing an old OCB and four heavy-duty disconnect switches.
2. Moving 138-kv potential transformers and light-duty disconnect switches to another foundation and reconnecting them.
3. Removing original potential transformer foundations and pouring new ones in the same location.
4. Installing heavy-duty 138-kv disconnects and the OCB in the former location of other OCB's.
5. Removing the through-line connection across both station buses. During construction, it was possible to operate for a week with one bank (New Car-



WINTER . .

best time

to save with a

BELL

Both before and after the first winter storm, they do some astonishing things with a Bell helicopter. A few of these: Spraying lines with anti-freeze, blowing off snow and frost, even breaking up ice with bamboo poles. Then there's the high cost item of winter patrol — as much as a *hundred times faster and surer* by Bell!

Winter is indeed the time to try your first Bell — as our Pencil Test will tell you. Take the test; then consider the three ways — Charter, Lease-Purchase and Outright Purchase — by which you can be *ready* for your Bell trial, when the first snow flies.

YES	NO	
☐	☐	Emergency line repairs are often held up in winter because trouble spots are difficult or impossible to reach.
☐	☐	We have substations that require over 300 miles of ground travel.
☐	☐	Regular line inspection is pinning down too many trained linemen.
☐	☐	Mapping of back country for projected line expansion is taking too much time.
☐	☐	We need an all-around air vehicle to act as aerial ambulance, cargo carrier, key man "taxi", and to serve community needs when called on.

Now tear out just the Test portion of this page and mail it, with your name, title, company and address, to: Department 236L, Bell Helicopter Corporation, Fort Worth, Texas. We'll send you additional information about the Bell in Utilities.

BELL HELICOPTER CORP.

FORT WORTH, TEXAS
SUBSIDIARY OF BELL AIRCRAFT CORPORATION

lisle) out of service during the day. First, the "Detroit" type (vertical) bus structure was erected on the northeast corner of the station. Next, the South Bend-Michigan City through-line was removed and the South Bend end was reconnected one bay further north, attached to what was previously the Hickory Creek OCB.

This line had been carried over the New Carlisle Station on short goat heads. This section of line and the goat heads were scheduled to be removed and retired. If a standard installation were used, new concrete foundations would have been built, and the two Laporte-Michigan City combination current-potential metering transformers would have been moved west onto them and the old foundations broken up. In the meantime, the three 138-kv station potential transformers were to have been moved to a temporary location and reattached. The potential transformer foundation was to have been broken up and removed.

In addition, when the above had been completed, the "Old South Bend" OCB was to have been disconnected, and all four heavy 138-kv disconnects were to be taken down, moved to the "Laporte-Michigan City" location and re-connected. The station 138-kv potential transformers were then to have been disconnected and moved from their temporary location to the "Old South Bend" foundation.

Instead, the job was completed in three working days at a cost of $1,227 for labor and material as against an original estimate of $3,200 and 15 working days for the conventional plan.

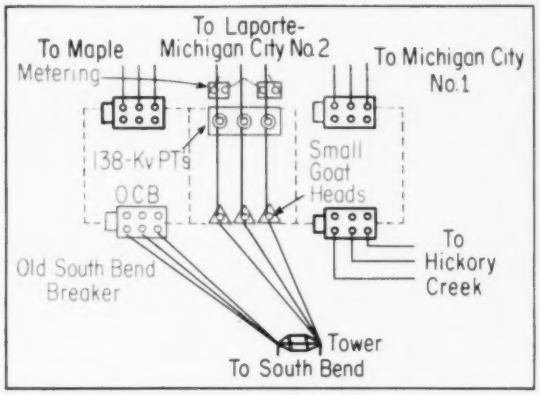
Additionally, the work was scheduled so that it could be done on straight time rather than overtime. Although the system could operate without the station main bank, there were two interconnections with Northern Indiana Public Service Co that had to be maintained.

Most work required both buses cleared. The intention was to do this by opening jumpers between the north bay and the rest of the station. However, clearances were too small to allow this. The problem was solved by stretching jumpers across the yard from the new South Bend OCB to the Michigan City OCB, attaching the jumpers between the top of the bushings and the bottom of the disconnects.

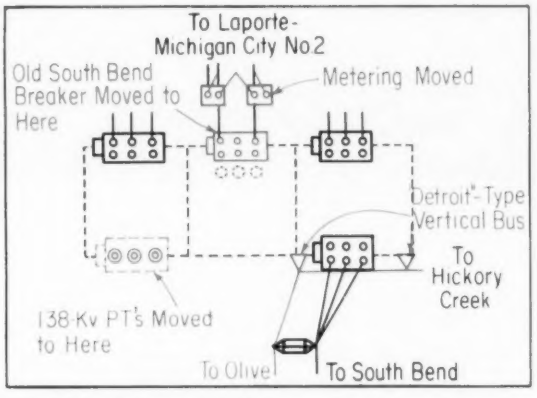
This provided a South Bend-Michigan City circuit complete with metering and a reasonably good relay system. It could be returned to an almost normal night condition by closing the bus selectors.

A second interconnection with Northern Indiana Public Service goes from New Carlisle to Maple Substation (Laporte, Ind.), Kingsbury Ordnance plant. It was planned to remove the connection during the early morning hours and place a set of jumpers between it and the Olive Circuit at New Carlisle. This, however, would have resulted in an undesirable metering setup.

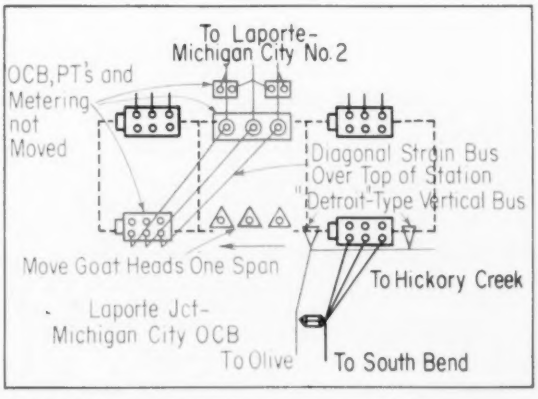
By removing the Olive-New Carlisle circuit and bypassing the Maple OCB at New Carlisle, it was possible to "run the 138 kv on the ground". The closest clearance to ground was about 8 ft. Both the jumpers in the north bay and this temporary connection were thoroughly protected by safety flags.



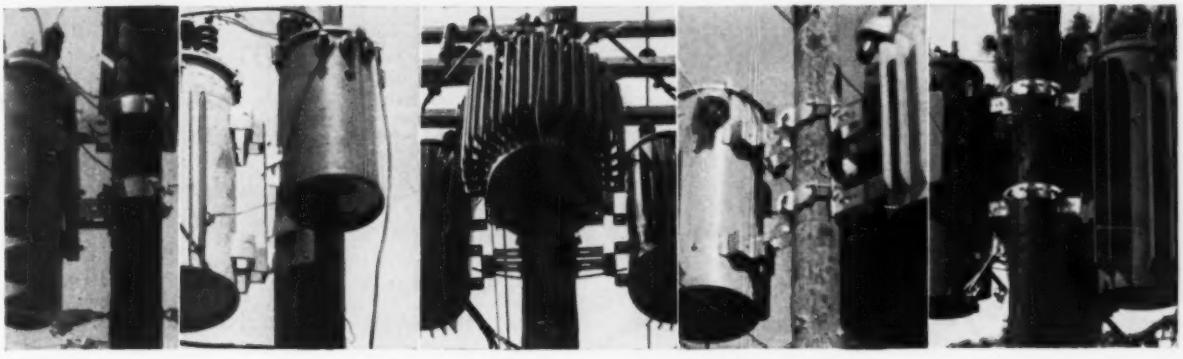
ORIGINAL LAYOUT of New Carlisle Substation had to be changed to take a 138-kv line from Olive that would be carried on the left-hand side of the South Bend towers. Substation bus connections are not shown



CONVENTIONAL CHANGES would have required the moving of the Old South Bend breaker, the 138-kv PT's, and metering equipment, as shown. Estimated cost of this method was $3,200, including 15 working days



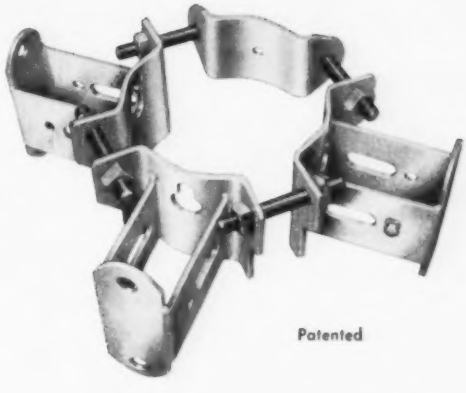
DIAGONAL STRAIN BUS over the top of the substation makes the tie to LaPorte-Michigan City No. 2 through the substation. This approach cost $1,227, including materials and labor, and took only three working days



First in the Field

with the clamp-type cluster mount

Universal



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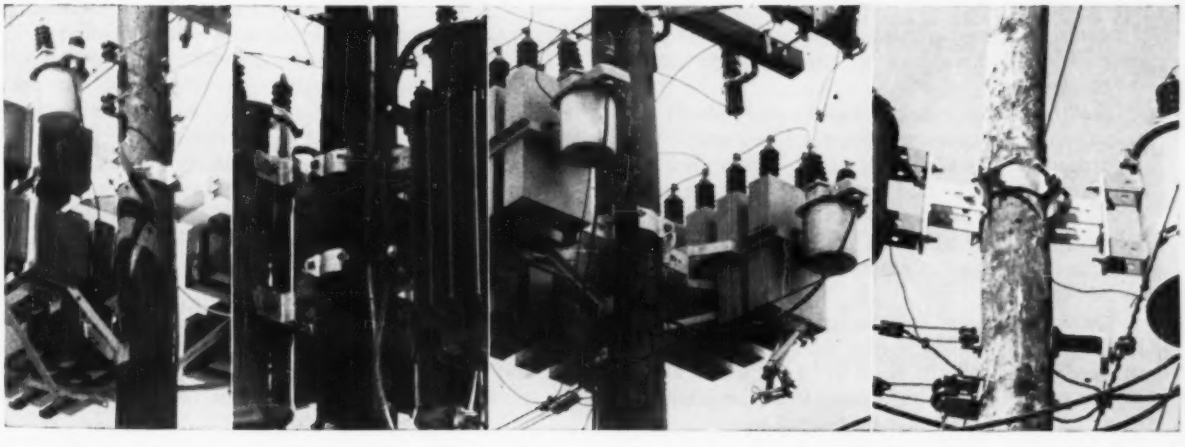
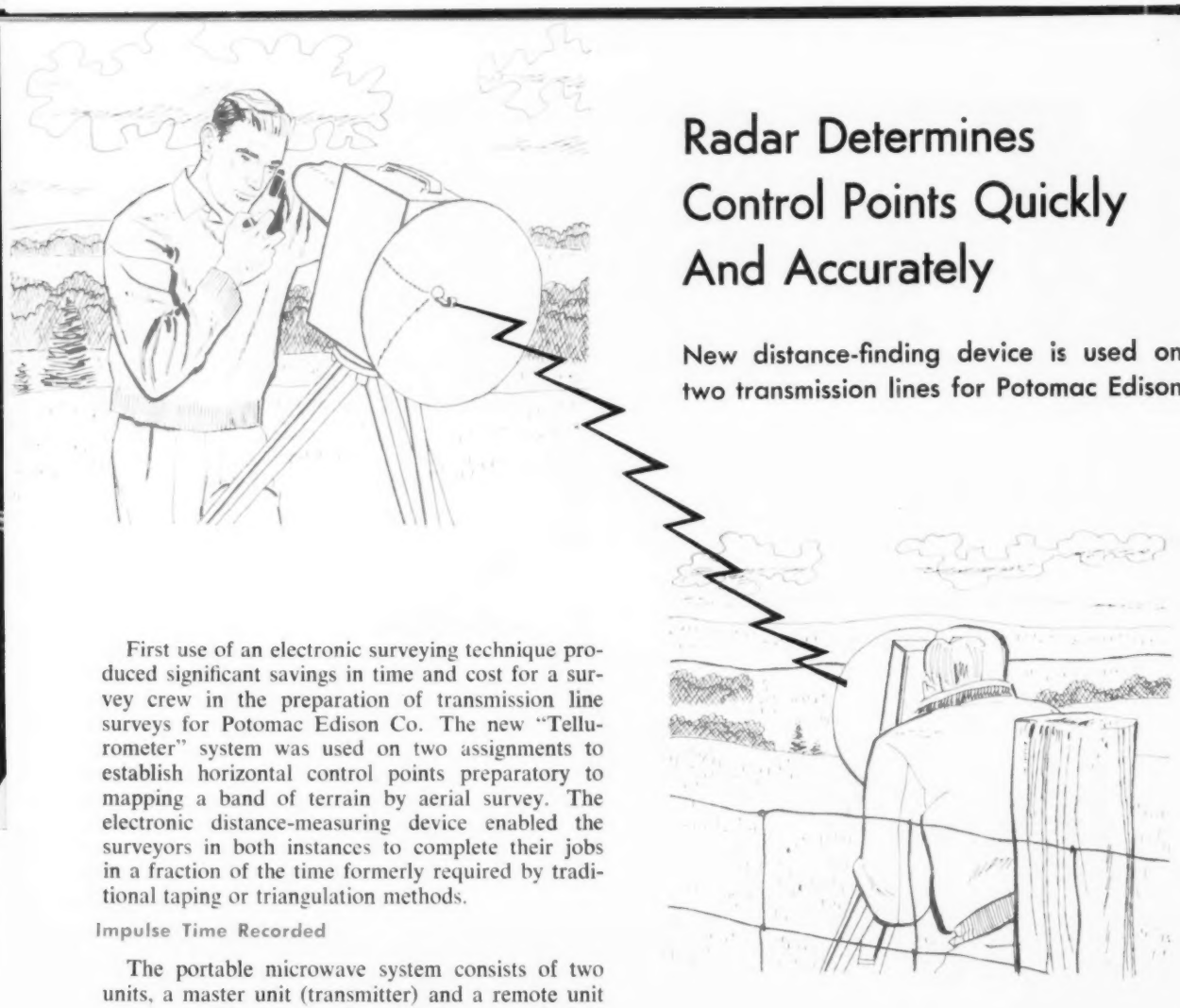




Radar Determines Control Points Quickly And Accurately

New distance-finding device is used on two transmission lines for Potomac Edison

First use of an electronic surveying technique produced significant savings in time and cost for a survey crew in the preparation of transmission line surveys for Potomac Edison Co. The new "Tellurometer" system was used on two assignments to establish horizontal control points preparatory to mapping a band of terrain by aerial survey. The electronic distance-measuring device enabled the surveyors in both instances to complete their jobs in a fraction of the time formerly required by traditional taping or triangulation methods.

Impulse Time Recorded

The portable microwave system consists of two units, a master unit (transmitter) and a remote unit (receiver). The system determines a line of sight between two points and records the time it takes a series of impulses to make a round trip between master and remote units. This time is easily converted into miles, feet and decimals of feet. The device is made by Tellurometer, Inc.

The system was first used in setting the location for a 26-mile transmission line between Frederick, Maryland, and Millville, West Virginia. On this project Potomac Edison called in Air Survey Corp, Arlington, Virginia, to survey the route and produce the specified contour by aerial photogrammetric methods. Before the route could be flown it was necessary to establish a number of strategic controls on the ground.

Traditional methods of ground survey would have taken weeks, considering that the line crossed three high mountains and the Potomac River. Thus the air survey firm decided to try the new electronic system. They decided to shoot across the Potomac River and from high point to high point down the 26-mile line instead of either chaining on the ground or triangulating.

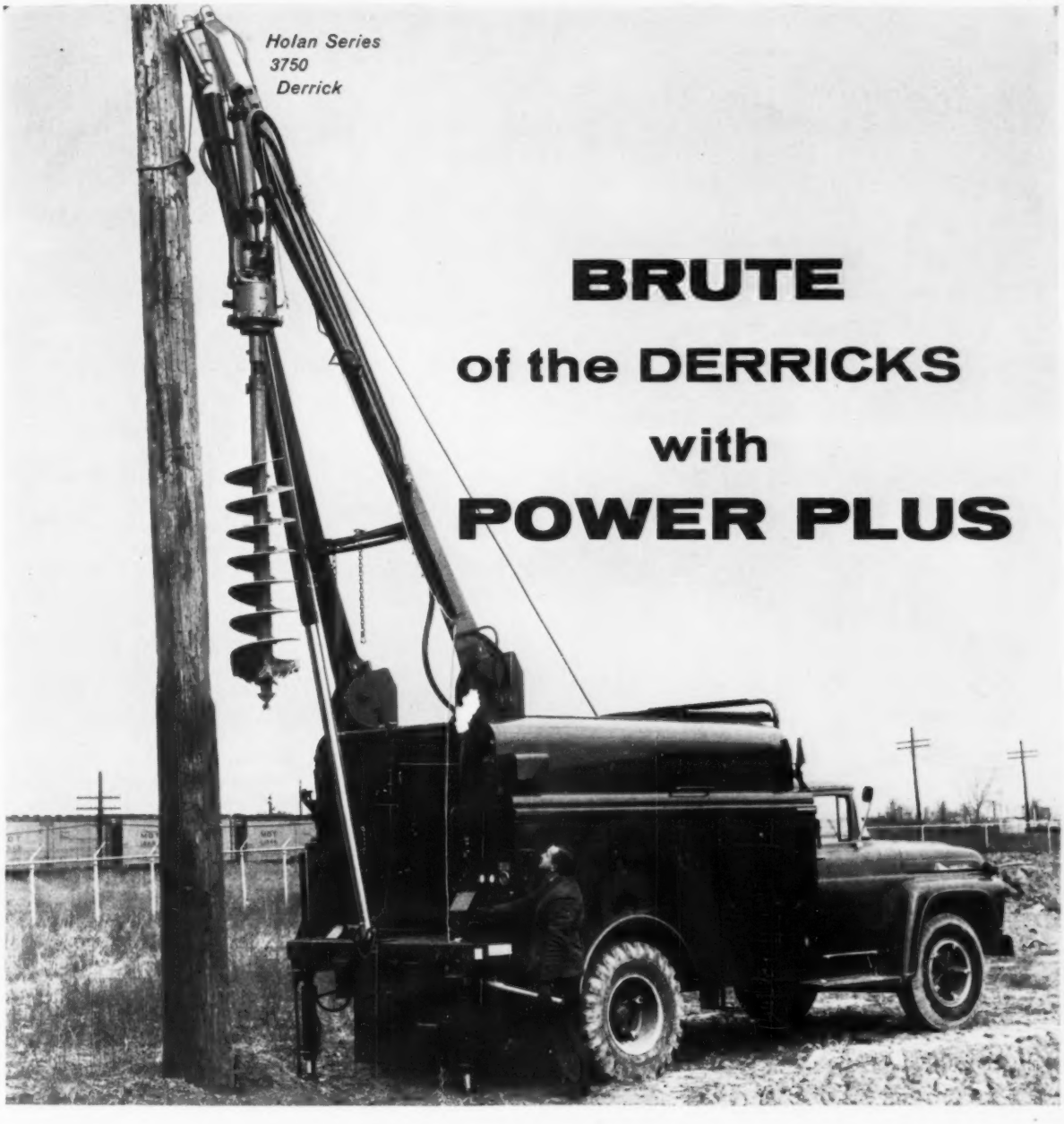
This transmission line project required the establishment of ten pairs of intervisible horizontal control points through the band to be mapped. The air survey party of three men completed the job in ten days. It is estimated that traditional methods would have taken five men at least 30 days.

The measurements were accurate to one part in 15,000, the surveyors found, well in excess of that specified for the location map. The manufacturer of the Tellurometer reports the system is capable of measuring distances from 500 ft to 40 miles. The longest shot on the Potomac Edison job was 103,440.15 ft (about 19½ miles).

Line Measured in 30 Min

On the second assignment, also for location mapping purposes, similar savings were realized with the electronic system. Although this route was not through mountainous terrain, it was unusual in another aspect. Using the system off one high position overlooking the Shenandoah Valley, the air survey crew was able to establish almost all the control points required for a 27-mile transmission line. It took the surveyors about 30 min to measure a line, including mounting the instruments at both ends.

Eight pairs of control points were needed for the valley route. Almost all points were established with the Tellurometer master unit on the one vantage point, even though most of the control points were miles away and not visible.



BRUTE
of the DERRICKS
with
POWER PLUS

It's been called "a brute of a derrick" by utility crews all over the country. That's because the new Holan Series 3750 Hydraulic Derrick with live boom is engineered to withstand abuse in the field.

And the 3750 has plenty of muscle. For the record, it has a 12,000-pound capacity, but it has actually been tested at 22,000 pounds.

An integral middle leg with live-boom action provides extra strength for butt-pulling, body loading and other heavy lifting assignments. The rectangular side legs are fabricated of long-lasting, rust-resisting high tensile steel.

Hoisting 5,000 pounds over the rear axle for body loading is a simple task for the 3750. And the 195° operating range makes it possible to lower the derrick to within five feet of the ground for easy threading of the winch line.

There's power to spare in the 3750—power for such tasks as forcing the Holan 5400 Multiple-Speed Digger shown here into hard and rocky soil. And the extra power makes it easy to remove an auger full of dirt.

Let us tell you more about this new Holan Derrick. Write us—or call your Holan Field Representative—for complete details.

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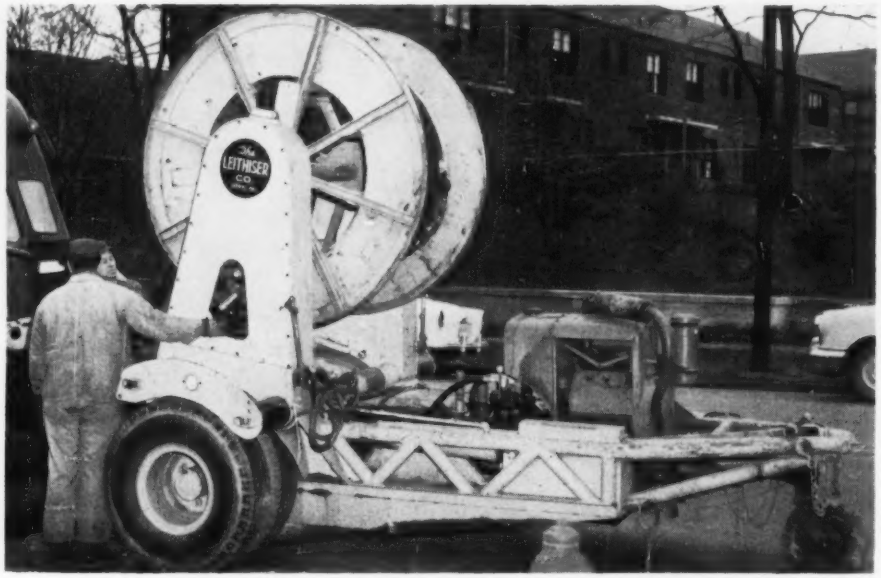
CIRCLE 83 ON READER SERVICE CARD

CONSTRUCTION



Powered Trailer Cuts Handling Cost

RICHARD E. KROFFKE, General Foreman, Cable & Industrial Section, Metering & Underground Dept, Cleveland Electric Illuminating Co, Cleveland, Ohio

Two power-drive reel trailers designed for Cleveland Electric Illuminating Co are responsible for a significant reduction in the overall cost of installing or removing large underground cables. Based on experience with the first unit, manhours to install 1,000 ft of cable were cut 38% compared with the old method; manhours to remove 1,000 ft of cable were reduced by 59%.

The trailer-mounted cable-pulling and reeling devices are essentially an adaptation of wire-tensioning equipment used in overhead highline construction and reconductoring. They were designed to overcome the large manpower requirements and the hazards of handling cumbersome tools, heavy reels, and cable used with truck-mounted winches, cable jacks, and manual control.

It was felt that hydraulically-operated, powered reel-turning and braking would be a decided advantage in an underground cable-pulling device. A proposal from CEI Co was submitted to the manufacturer of the "Reel-O-Matic" overhead line tensioner. The manufacturer offered a newly designed cable-reel trailer unit which was much more compact than its first proposal and much more maneuverable.

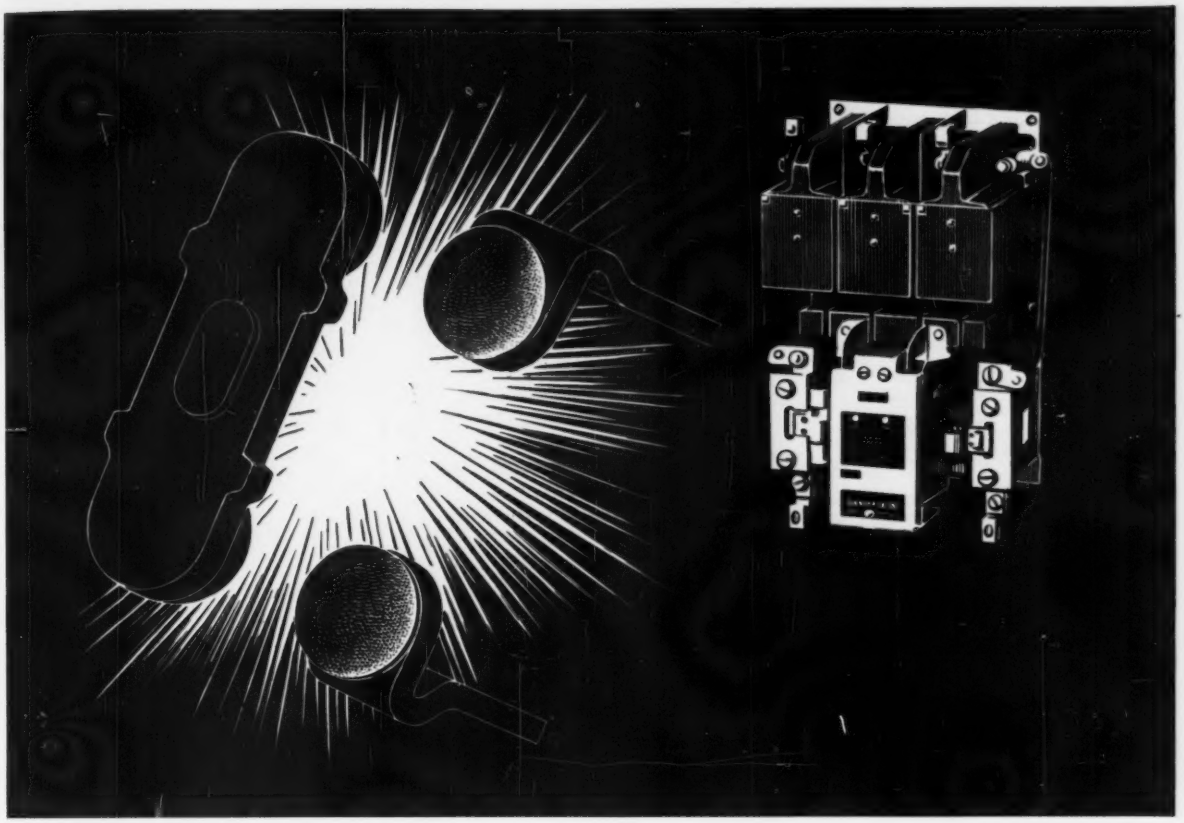
The trailer, powered by a 15-hp gasoline engine, has the ability to raise and lower a four-ton reel of cable; turn a reel at the rate of 0 to 20 rpm; provide a break-away pull or tension of 15,000 lb by means of a hydraulic-ram; and handle reel sizes up to 72x60 in. This unit, the 4-ton Leithiser Power Drive Trailer Unit, was adapted by CEI Co.

Although it could only handle 70% of the work, two years of experience demonstrated that the reel-positioning feature was satisfactory except for the size and width limitations, and the powered reel-turning and brake features were completely satisfactory, but the hydraulic-ram "break-loose" feature was not satisfactory because of the slow piston-return action. However, this new device did permit a substantial reduction in crew size.

The second unit has refinements which overcome the limitations of the original machine. It is a larger machine, able to handle reels up to 84 in. in diameter, up to 62 in. in width, and 6 tons in weight. The hydraulic ram "break-loose" mechanism has been redesigned to give faster return action and was increased to 20,000 lb breakaway pull. It is powered by a 35-hp engine.

The new trailer can handle almost all of the company's cable reels, the exception being 132-kv cable reels and 69-kv single-conductor cable reels.

(More Construction on page 86)



For Dependability in Power Contactors Specify Mallory Contacts

It pays to be particular about the contacts that go into the motor controllers, line starters and power contactors you buy. The reliability of this type of equipment . . . and of any other circuit-switching device . . . depends considerably on the contacts used in them. Just "any good contact" isn't good enough for this service.

For the special requirements of power contactors, Mallory has developed a series of silver-cadmium oxide materials with unusual properties. They are unequalled in their resistance to welding . . . will take several times the current that would weld fine silver contacts of the same size. They have low contact resistance which results in low temperature rise in high current circuits. These materials withstand the heavy arcing and severe duty cycles characteristic of motor control service, showing low rate of arc erosion and wear.

A unique Mallory development, silver-cadmium oxide contacts are the choice of leading contactor manufacturers. They are part of a broad line of materials created by Mallory pioneering in powder metallurgy techniques. Don't settle for less than Mallory quality and performance.

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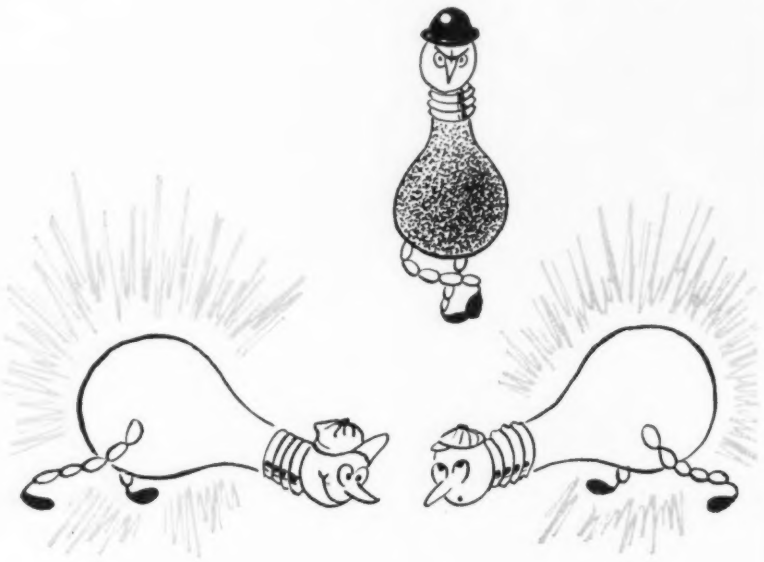
High Density Metals

Semiconductor
Silicon Rectifiers



Lightning Bug-aboo

During the past three or four years, hundreds of thousands of Fisher-Pierce 6600A controls with a half a second time delay have yielded exactly *one* complaint about false turn-off reportedly caused by lightning. This field experience also includes many mercury vapor installations—one, in fact, where 4000 lights are individually controlled by 6600A units. What could be better proof that long time delay isn't necessary?

The facts and figures we've been able to dig up help explain why turn-off doesn't occur and why long time delay isn't needed. The intensity of the average flash—measured at the control—doesn't begin to reach the turn-off level, nor does it last for the necessary half-second. A flash rarely exceeds 0.001 second.

But even if the numbers are hard to believe, what has happened in the field still makes the most sense of all: lightning just doesn't make a good case for long time delay. It's a bugaboo that can cost you needless man-on-the-pole hours, if you let it bite you. The Fisher-Pierce Co., 82 Pearl Street, South Braintree 85, Massachusetts.

FP

FISHER PIERCE

PHOTOELECTRIC LIGHTING CONTROLS

AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

Cluster-Mount

KENNETH E. BRANCHEAU, Overhead Standards Engineer, Toledo Edison Co, Toledo, Ohio

Cluster-mounted primary metering soon will be standard construction for all primary services on the Toledo Edison system. Butyl-molded instrument transformers are used in conjunction with the cluster mounting principle in developing this standard, which stems from successful use on our system of cluster-mounted transformers and capacitors.

Cluster-mounting of primary metering will save about $150 per installation over our present crossarm mounting standard. Preassembly of the entire unit in the shop cuts field installation time drastically. A crew now will be able to install the complete unit by making a few simple connections instead of installing each component separately. Units of 10, 25, 50 and 100-amp rating will be made up in advance and stocked for future needs.

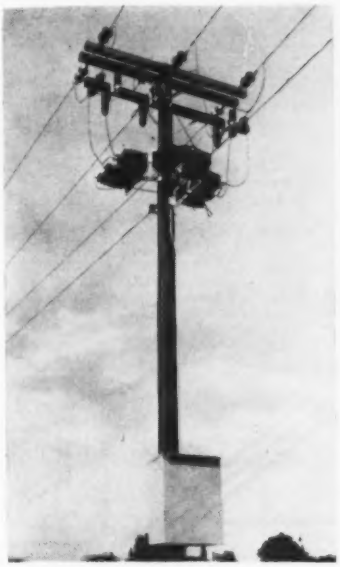
Horizontal transformer mounting is used to provide maximum electrical clearances, more climbing space and quick shop

Large Pocket in Bucket

J. C. SHELTON, Line Foreman, Appalachian Power Co, Rocky Mount, Va.

Addition of a large pocket to the canvas material bucket is a simple and practical solution to the problem of keeping small

...tering Cuts Cost



assembly. Because the instrument transformers are mounted in a fixed positon on the cluster bracket, ½-in. Seal-tite conduit can be used for prewiring the secondary. This use provides mounting flexibility, which will be beneficial should it be necessary to replace a defective transformer in the field.

...Holds Small Parts

parts accessible to the linemen yet separate from tools. The large pocket enables groundmen to keep separate the small connectors, sleeves, etc, so that they don't get lost under the larger cutters, tools, and other items. The lineman can reach into the pocket and get necessary material without difficulty. The idea of the large pocket was developed by the author and his line crew.

Pockets were installed in canvas buckets by a local upholstery company at a cost of $1.50 per bucket. Pockets probably would cost less if purchased with the buckets. Canvas material of about the same weight as the bucket was used. A small rubber hose was sewn into the top edge of the pocket to keep it open.

HOW DO REPUTATIONS GROW?

THE REAL REASONS BEHIND THE FAST-GROWING RESPECT FOR PRECISION TRANSFORMERS

FEATURE ARTICLES HELP!

BUT . . . THE *TRANSFORMER* IS MOST IMPORTANT!

THESE ARE THE GUTS . . . OF THE PRECISION TRANSFORMER

SPECIAL CORES: Specially designed wound cores, manufactured from highest quality, non-aging cold rolled silicon steel. Processed to obtain the best possible characteristics for top performance and most output per pound.

RIGID CORE CLAMPING: The cores are individually clamped and braced throughout. Complete assembly positively located. Noises are suppressed . . . permanent alignment maintained regardless of shipping shocks.

SPECIAL COIL DESIGN: Coils are wound with large number of cooling ducts. Transformers are designed for low winding temperature gradient permitting large overload capacity. Temperature variations are minimized—there are no hot spots.

LOW IMPEDANCE: This feature means, (1) better regulation . . . (2) overloads with minimum revenue loss . . . (3) elimination of low voltage complaints.

BUSHINGS LOCKED WITH TANK: Bushings don't turn with the bolt when installing transformer. Wet process porcelain means high dielectric and mechanical strength.

EASY IDENTIFICATION: The TAP CHANGER is marked on base and on tap changer indicator for positive identification. It is designed to be easily accessible . . . quick snap action.

NO CONNECTION ERRORS: Low voltage leads are permanently identified to prevent improper reconnections in the field.

SEEPAGE PROTECTION: All tank seams are automatically welded and pressure tested to assure against seepage.

LEAK PROOF SEAL: Designed with simple, single bolt cover fastening which provides uniform pressure on gasket. Spring action of cover insures leak proof seal.

DURABLE GASKETS: The gasket is made of an oil and askarel resistant material (1) to insure long life . . . (2) to maintain elasticity through wide range of temperature and pressure changes.

MAINTENANCE CUT: A chromate primer is used. Also two coats of enamel are applied — each separately baked and tested to meet the most rigid specifications.

TESTING FOR DEPENDABILITY: Production line impulse assures uniform High Quality. All NEMA and EEI standards and tests are complied with in full.

A Typical, modern design PTC Transformer

PRECISION TRANSFORMER Corp. stands behind all its transformers with the industry's ONLY 5-YEAR Unconditional GUARANTEE.

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QUIET • EFFICIENT
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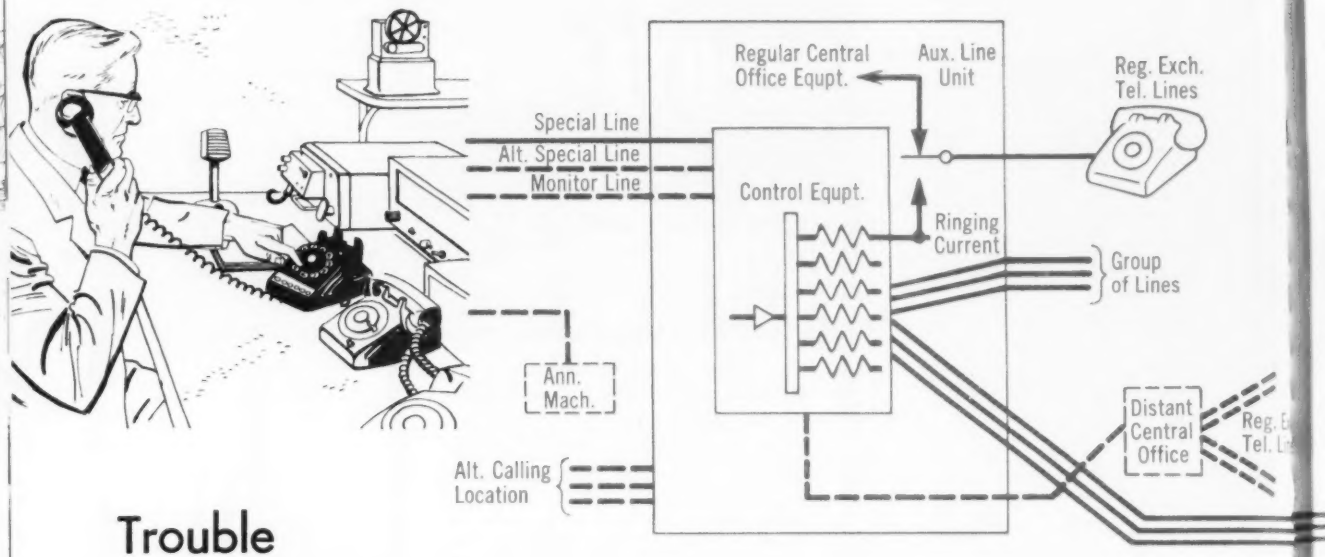

Trouble Dispatcher Can Alert Many Phones

A new telephone alerting system that enables one telephone to reach as many as 480 different telephones at the same time with one turn of the dial has been developed by the Bell System. This system is designed to allow power companies and other public service organizations to easily and quickly alert and dispatch maintenance crews in cases of storm damage, widespread outages or other emergencies.

The Bell Group Alerting and Dispatching System enables a dispatcher not only to notify personnel that there is an emergency, but also to tell where help is required and possibly what routes can be used in getting to the trouble. To alert and dispatch personnel, the dispatcher simply dials a one-digit code. Equipment in the telephone central office immediately connects him to all the telephones in the group he has selected.

At the same time, the called telephones start to ring in distinctive staccato bursts. The dispatcher can begin his message immediately after dialing. An op-

JUNIATA SUBSTATION	
132 KV LINE NO 130-29	
DCX DIRECTIONAL DISTANCE PHASE	
RELAYS MODEL 120CK17A22A	
OHM UNIT RANGE .25 - 250	
MHO UNIT RANGE 250-1000	
ASSOCIATED RPM TIMING RELAY	
MODEL 12RPW11D2A .15-300 SEC	
CT RATIO	300.00
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REACH RELAY OHMS	.53
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K SQUARE PAIR OF TAPS PERCENT	80.00
CALIBRATION	
VOLTAGE	80.00
CURRENT AT 60 DEGREES LAG	9.98
SET TARGET UNIT ON .5 AMP TAP	
THESE SETTINGS ON THE DCX	
RELAYS LIMIT THE FIRM LOAD	
TRANSFER FROM JUNIATA	
SUBSTATION TOWARD 130-29	
LINE TO 1420-1570 MVA AT 80	
TO 90 PCT PF AND 132 KV	

Computer Selects Relay C

EDWARD H. MacDONALD, Relay Engineer, Philadelphia Electric Co, Philadelphia, Pa.

Computations that formerly required hours are being handled in seconds as Philadelphia Electric Co launches a plan to reduce the cost of protective relay studies. The time needed to apply directional distance phase relays to two-terminal transmission lines already has been reduced considerably with the aid of an IBM 650 computer. It is believed this is the first time the digital computer has ever been used to

RELAY SETTING DATA for a typical line terminal are calculated and printed out by a digital computer to reduce the time and effort of applying directional distance phase relays to two-terminal transmission lines

Executive Office

Commercial Department

Operating Personnel

tional feature permits him to record it at the same time. The recorder then repeats the message for the duration of the call.

Distinctive ringing of a telephone connected to the call indicates that an alert call is waiting on the line. If any of the lines is busy when the alert is dialed, a special "camp-on" feature seizes the line and rings as soon as it becomes idle, provided the dispatcher has not already ended the call. After receiving an alerting message, a person can use his phone for regular calls after a momentary hang-up.

CIRCLE 89 ON READER SERVICE CARD

ay, Calculates Settings

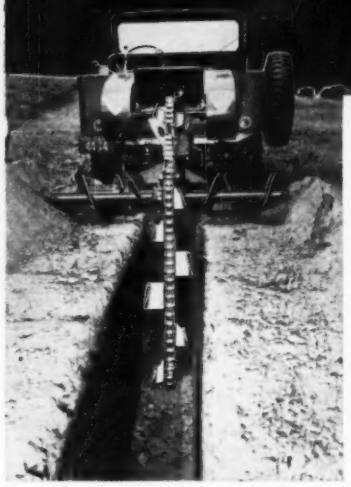
perform the computations associated with the application of protective relays.

The printed output of the computer for a typical line terminal, as illustrated, was calculated and printed in 30 sec. In the past, several hours were required to do the calculation manually. The format presented by the machine is suitable also for use by relay testers to set the relays. Thus, the computer application eliminates long hand drafts, typing, proofreading, and associated human errors. In addition, it does a complicated calculation in seconds that originally took an experienced engineer more than 2 hr work out.

In using a digital computer to apply any protective relay, the engineer must provide the machine with input data in the form of power system parameters. In the specific case, where directional distance phase relays are being applied, the input data punched on cards includes transmission line characteristics, line voltage, minimum fault current, and instrument transformer ratios. The computer not only prints the results in useable form, but also automatically selects the preferred relay to protect a specific line and calculates the relay setting data for that line.

Philadelphia Electric views the directional distance phase relay application as but the first of many computer program subroutines required to construct a general relay application program embracing all types of relays in common use. For example, subroutines for applying carrier current relays are in the development stage. When these are combined with others yet to be developed, they will form a general computer program that will be used by engineers to solve quickly, accurately, and economically those protective relay problems normally encountered in daily work.

LET AUBURN TRENCHERS CUT your TRENCHING COSTS!



If you want your trenching done at less cost, and with less trouble, you want **Auburn.** This simple, time- and customer-proven machine digs where other trenchers won't even start. It has a variable speed, hydraulic drive that automatically adjusts speed to changing soil conditions, and it operates up to 800 feet per hour. **Auburn** costs less to own, requires less maintenance, seldom has any downtime, and is one-man operated. It has interchangeable digging bits and boom that let you dig from 6 to 14 inches wide, down to 6 feet deep. Special digging bits are available for rock, shale, and frozen ground.

Auburn is the world's largest producers of trenchers.

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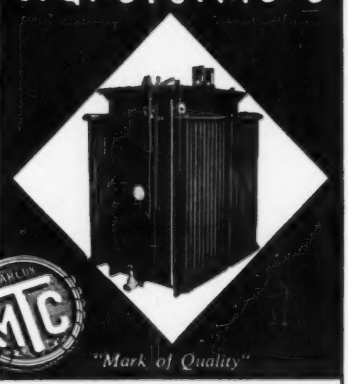
We don't know . . . but both of these nationally famous department stores use Marcus Transformers for power and lighting distribution.

Marcus "Mark of Quality" transformers GUARANTEE trouble-free service and safe, dependable operation. For bigger profits and greater customer satisfaction, use MARCUS for your next installation.



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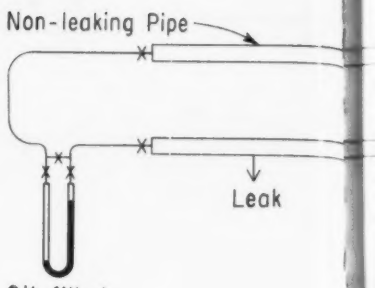


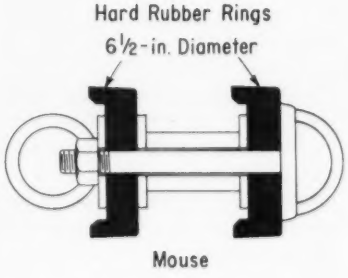
Mouse and Freon

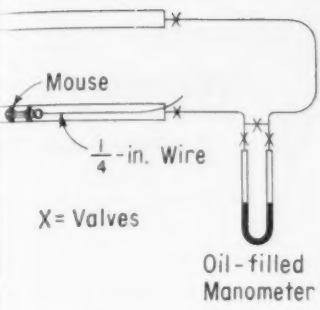
A. B. CRAIG, Asst Supt, Engineering & Construction Dept, Boston Edison Co, Boston, Mass.

Use of a "mouse" plug and Freon reduced the effort and expense of digging many holes in the search for leaking welds in empty pipe for pipe-type cable. This method devised by Boston Edison Co for isolating the leaking section is applicable when two empty pipes along the same route are available.

This method was one of a number considered to find leaks in two 3,200-ft lengths of pipe for 115-kv cable. The 6-in. somastic-coated pipe was laid on a 4-in. bed of sand (18 in. on centers from a second pipe) with a minimum cover of 4 ft. Each end of the double random-length pipe was flared for a chill ring for welding. Gamma-ray photos were taken as welds were completed.

Pressure-drop tests on the completed pipe revealed that one section leaked at a 1-psi per day rate and another at a 2-psi rate. After several methods of finding the leaks were studied, the mouse and Freon method was devised.





Isolate Pipe Leak

In this method, a tight-fitting mouse, as illustrated, is blown into the pipe for a controlled distance. This mouse acts as a plug and divides the pipe into two sections. The section containing the leak is determined by a pressure-drop test, the set-up for which is shown.

In this test the non-leaking adjacent pipe serves as a reservoir for nitrogen under pressure. The manometer by-pass and the valves on the end of each pipe section are opened until equilibrium is reached and the manometer by-pass valves are closed. The manometer valves then are opened and readings taken every few minutes. The manometer on the leaking side of the mouse will indicate a pressure drop while the other manometer either stays at zero or indicates a much slower pressure drop.

The mouse was positioned in the pipe for each test by blowing it in with nitrogen pressure. A ¼-in. steel wire attached to the trailing end of the mouse was fastened to the inside of the test cap at the end of the pipe. As a piece had to be spliced to this ¼-in. line for each subsequent test, the foregoing method was used only to determine which quarter of the section (800 ft) contained the leak.

All X-rays of the welds in the manhole-to-manhold length of pipe containing the leak were re-examined during the test. This disclosed several possibilities, two of which were in the isolated area.

Holes 1½-in. diameter were

(*Continued on page 92*)

TOP PHOTO: Location: Fairleigh Dickinson University, Madison, N. J. • Electrical Consultant: H. L. Sykes
LOWER PHOTO: Location: Rath Park, Franklin Square, L. I., N. Y. • Architect: Herbert D. Phillips
Consulting Engineers: Barstow, Mulligan & Vollmer

P&K CIRCLElux DAVITS & POSTS

modern lighting at a realistic cost

Here are two contemporary outdoor lighting installations – one an all new municipal swimming pool and recreational area – the other, a prominent New Jersey University. Both chose the P&K all aluminum CIRCLElux lighting package to illuminate and compliment their roadways, walkways, landscape and architecture.

The sweeping lines of the P&K CIRCLElux davit blend with the modern one story architecture of the Rath Park Swimming Pool. Yet, the modern, but stately, design of the P&K CIRCLElux post is in good taste with the traditional architecture of Fairleigh Dickinson University. The CIRCLElux lighting package is the correct low level lighting choice to compliment almost all types of architecture.

The P&K CIRCLElux is available in a wide range of davit styles and mounting heights. The post is available in one basic design but at various mounting heights and with the CIRCLElux you have a choice of three light sources – incandescent, mercury vapor and fluorescent. This combination of luminaires and davits or posts will enable you to specify "packaged" lighting units. This means easier specifying by using matched components which in turn can customize your lighting projects.

Send in your reservation now for the *new* CIRCLElux catalog.

P&K

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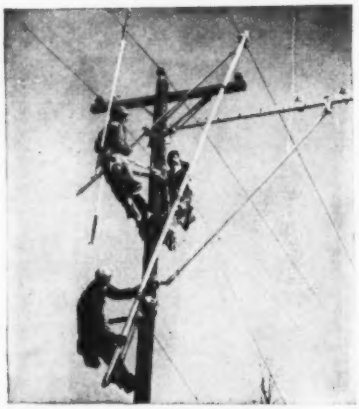
FOR OVER 30 YEARS



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BASHLIN Quality Body Belts with the additional Nylon Safety Feature . . . Work Safely . . . Comfortably . . . with tools in easy reach.

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Ask for . . . CATALOG NO. 55

W. M. BASHLIN CO.

GROVE CITY, PA.

Mouse and Freon

(*Continued from page* 91)

drilled through the pavement over each suspected weld to within 1 ft of the top of the pipe; 1-in. steel conduit was placed in the holes and plugged at the top with paper. It was concluded, from talks with engineers of other utilities and of cable maufacturers, that Freon could be used safely.

A 50-lb charge of Freon was introduced into the leaking pipe, followed by dry nitrogen to raise the internal pressure to 40 psig. After about 2 hr a Freon leak detector gave a positive indication at one of the drilled holes; the other showed negative. The leaking weld was uncovered and repaired and the 300-psi pressure-drop test repeated after all Freon had been removed. The second leak was found in the same manner. Although the Freon method could have been used exclusively, use of the mouse in this case minimized the number of holes to be drilled through a new pavement.

Cap Handholes To Speed Startup

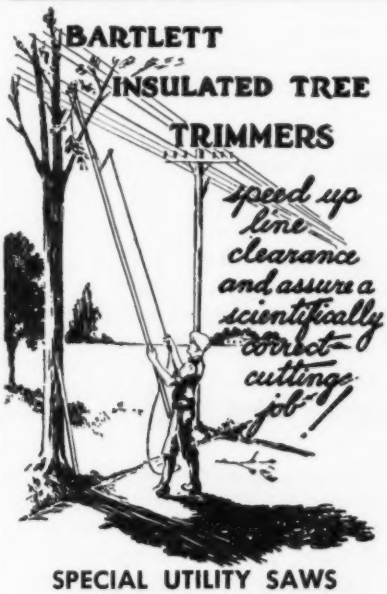
CHARLES WASELKOW, Supervisor of Mechanical Engineering, Public Service Co of Colorado, Denver, Colo-

Capping of handholes to eliminate leakage allows Public Service Co of Colorado to significantly reduce the startup time for an older unit used for peaking. With 380 handholes capped, the boiler can be put on the line in 1½ hr instead of 6-7 hr.

When the No. 1 boiler of PSC's Arapahoe Plant was relegated to peaking service, it was found that excessive leakage through handholes prolonged the startup time. To convert the boiler to fast startup, it was necessary to cap and seal-weld 380 handholes. Gaskets were removed entirely to eliminate any "pack" movement.

When severe cracking occurred with the first seal welds, a soft, low-hydrogen rod was used and satisfactory welds made.

BARTLETT INSULATED TREE TRIMMERS



SPECIAL UTILITY SAWS

Complete line of hand saws. Illustrated is 124-B with 24-in. blade, with fast-cutting teeth 4 points per inch. Combines fast, smooth cutting. Send for catalog No. 39.

BARTLETT MFG. CO.

3048 E. Grand Blvd., DETROIT 2, MICH.

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FOR RUGGED DEPENDABILITY

Specify *Grip-Ite* EXPANDING EARTH ANCHORS

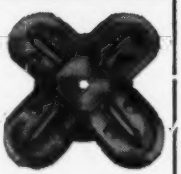
Exclusive Grip-Tite *wing* dimples, plus deeply embossed base plate, distributes stress evenly resulting in greater holding power.

Four-Way Design places a greater portion of expanding area into undisturbed soil and yields more holding power in average soils.

Come To Us With Your Anchoring Problems

Grip-Tite anchors come with *nut retainer*. Prevents anchor from sliding up the rod during installation. Permits salvage, too.

Exclusive double-strength anchor top prevents damage from expanding tool during installation.



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STEEL EXPANDING *Grip-Ite* ANCHORS

Grip-Ite **MANUFACTURING CO.**

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Simplex PRODUCTS GUIDE

SIMPLEX WIRE & CABLE CO., CAMBRIDGE 39, MASSACHUSETTS, U.S.A.

Simplex ANHYDREX Insulated Cables for Power transmission and Communication (like the Simplex TIREX Portable Cords and Cables shown in adjacent column), though manufactured as stock products, are custom designed to suit all service requirements. A large technical and engineering staff at Simplex' main plant is equipped to give you the benefits of their long experience in electrical cable planning.

ANHYDROPRENE — Simplex ANHYDROPRENE Cables are designed for economical installation in ducts, conduits, racks, trays and raceways. Stock sizes AWG 14 to 1000 MCM are recommended for 90 C service in WET or DRY locations. The words "Simplex ANHYDROPRENE" are either printed or molded plainly on the jackets of all ANHYDROPRENE cables. This marking signifies the traditionally high quality of a Simplex product.

CATALOGUE #1028

ANHYDREX-NEOPRENE — Simplex ANHYDREX-NEOPRENE Cables have the added mechanical protection of a heavy wall of neoprene jacketing. These cables are manufactured for use in aerial installations and for direct burial service. Stock sizes AWG 14 to 1000 MCM are recommended for 90 C service in WET or DRY locations.

CATALOGUE #1028

ANHYDREX-PLASTEX — Simplex ANHYDREX-PLASTEX (ANHYDREX-insulated, PLASTEX-jacketed) Cables are scientifically designed for compatibility between insulation and jacket, and for perfectly balanced performance in ducts, conduits, aerial and direct burial installations. ANHYDREX-PLASTEX Cables are recommended for service in a number of environments but especially where oils and chemicals are a problem.

CATALOGUE #1028

ANHYDREX Insulated Control Cables — Simplex ANHYDREX Control, Signal and Communication Cables have an additional thickness of appropriately coded neoprene over each individual conductor, plus heavy-duty neoprene jackets. ANHYDREX insulation provides excellent signal reproduction and is exceptionally stable, even when operating with high ambient temperatures.

CATALOGUE #1028

ANHYDREX XX — Simplex ANHYDREX XX is a butyl-based insulation of the highest possible quality. Because of its exceptional resistance to heat and ozone, it has general applications in circuits operating up to 35,000 volts, with permissible conductor temperatures of 90 C. to 5KV, and 85 C to 17KV — in wet or dry locations.

CATALOGUE #1023

CONDEX — Simplex CONDEX Cables are protected against mechanical damage by interlocked metallic armor. The armor is manufactured of galvanized steel, plain or baked enameled (colored) aluminum, bronze or other metals, and can be applied over any cable core within a very wide diameter range. CONDEX Cables may be further protected by a thermoplastic covering over or under the metallic armor.

CATALOGUE #1024

TIREX SO and SJO Cords — TIREX SO and SJO Cords are constructed to meet the most rigid specifications. All of their special features are carefully selected and processed to give maximum qualifications for portable service. They will twist without kinking, and bend without breaking. TIREX stranding affords maximum flexibility without sacrificing strength.

Conductor temperature rating 75c

CATALOGUE #992

TIREX Low Voltage Portable Cables — TIREX Low Voltage Cables are individually designed for specific applications. They are practically indestructible when used to do the work for which they are intended.

Conductor temperature rating 75c

CATALOGUES #992 & #1011

TIREX High Voltage Portable Cables — TIREX High Voltage Portable Cables have unequaled strength and versatility. Designed primarily to transmit energy to mobile electrical equipment, they are also used as temporary power lines during alterations or emergency repairs.

Conductor temperature rating 75c

CATALOGUE #1012

TIREX Mine Locomotive Cables — TIREX Mine Locomotive Cables — both single and two-conductor concentric — are approved by the Bureau of Mines and have the raised marking "P-101 BM" on their heavy-duty neoprene jackets. All TIREX Cables are cured and conditioned for service in lead.

Conductor temperature rating 75c

CATALOGUE #1011

TIREX Mining Machine and Shuttle Car Cables — TIREX Mining Machine and Shuttle Car Cables are designed for stability under today's rigorous mining conditions. The insulated conductors are "ribbed" or gear-shaped. This feature causes them to interlock with the heavy duty neoprene jacket and prevents them from slipping. Both Type W and Type G have "P-101 BM" molded onto the jacket.

Conductor temperature rating 75c

CATALOGUE #1011

TIREX Dredge and Shovel Cables — TIREX Dredge and Shovel Cables are masterpieces of engineering achievement. Every consideration has been given to safety and durability. Simplex special cured-in-lead neoprene armor effectively resists all the elements normally encountered in this type of work.

Conductor temperature rating 75c

CATALOGUE #1012

TIREX Welding Cables —TIREX Welding Cables are scientifically stranded for maximum flexibility without wrist drag. Cured-in-lead neoprene jackets provide utmost safety for both operator and bystanders.

Conductor temperature rating 75c

CATALOGUE #1011

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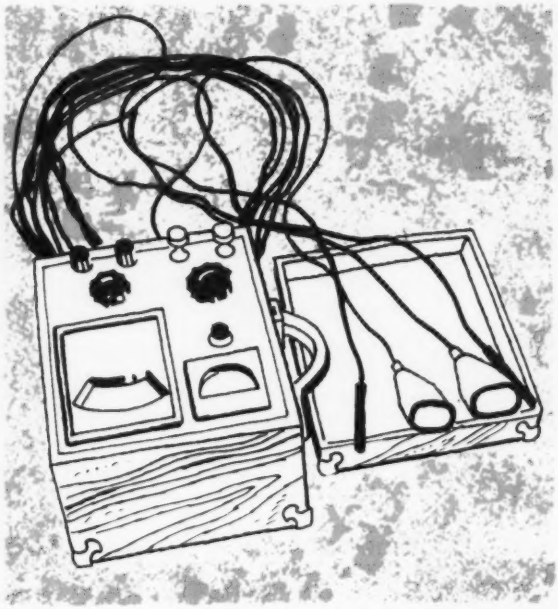


Microhm Meter Detects Trouble, Aids in Preventive Maintenance

MORGAN H. MILLS, Supervisor of Maintenance, Substation Division, Southern California Edison Co, Los Angeles, Calif.

Portable microhm meters have proven a rapid and convenient means of locating poor connections and faulty contacts during preventive maintenance of substation apparatus. The meters are standard equipment for substation maintenance crews of Southern California Edison Co. The battery-operated devices are relatively low in cost, light-weight, and of required accuracy.

Through detection of indications of possible trouble before it occurs, many equipment outages and resulting high cost of emergency repairs have been prevented. The initial cost of instruments and extra labor beyond usual procedures have been more than repaid. The portable meters were provided originally to check the condition of circuit breaker current-carrying parts. Many other practical uses since have been found for the portable meter.

Resistance tests are made on each oil circuit breaker pole from bushing cap to bushing cap. By comparison with similar readings, a fair idea of internal conditions can be deduced. Loose or corroded connections will be indicated as well as poor current-carrying contacts. When a high resistance reading is encountered and the reason is not obvious, the meter can be used to isolate the cause quickly.

During routine overhaul of synchronous condensers, loose or corroded field lead connections can be detected, especially inside the shaft where visual inspection is impossible. Measurement of each field lead is made from a point on the field pole connection to the corresponding collector ring (with brushes lifted). These readings are included in each overhaul report and compared with later readings. A change of 20% or more is investigated.

For machine exciters, microhm readings are taken between the negative bus and each negative brush arm and between the positive bus and each positive brush arm. Transformer connections are checked during installation and tap changer contact resistance is checked periodically.

Microhm readings also provide useful indications of condition on (1) step-type regulator contacts, (2) grounding connections where corrosion is a problem or where adequate visual inspection is impossible, (3) disconnect switches, and (4) bushing drawlead connections to upper cap.

Because the instrument is a low-current device, a single good contact may indicate proper resistance but the contact or connection being tested may not be capable of carrying rated current. Then other indications of trouble must be relied on. However, higher than normal resistance readings definitely mean trouble.

(More Maintenance on page 96)

WAGNER Dry-Type *General Purpose* Transformers

...WHISPER WHILE THEY WORK

New... from Wagner... totally enclosed dry-type transformers *filled with epoxy compound.* Their designation: Type AE Single Phase, 1 to 10 Kva.

Use these transformers for all general purpose applications, including those where noise must be minimized. They have a low sound level... the result of encasing smaller Form W core and coils in solid epoxy compound. The compound insulates, reduces sound-producing vibration caused by core excitation ... and provides enough support and mechanical strength to eliminate the need for metal framework and other subassemblies that are subject to vibration. *The result:* a whisper-quiet transformer that can be used anywhere, even in quiet areas of offices and hospitals.

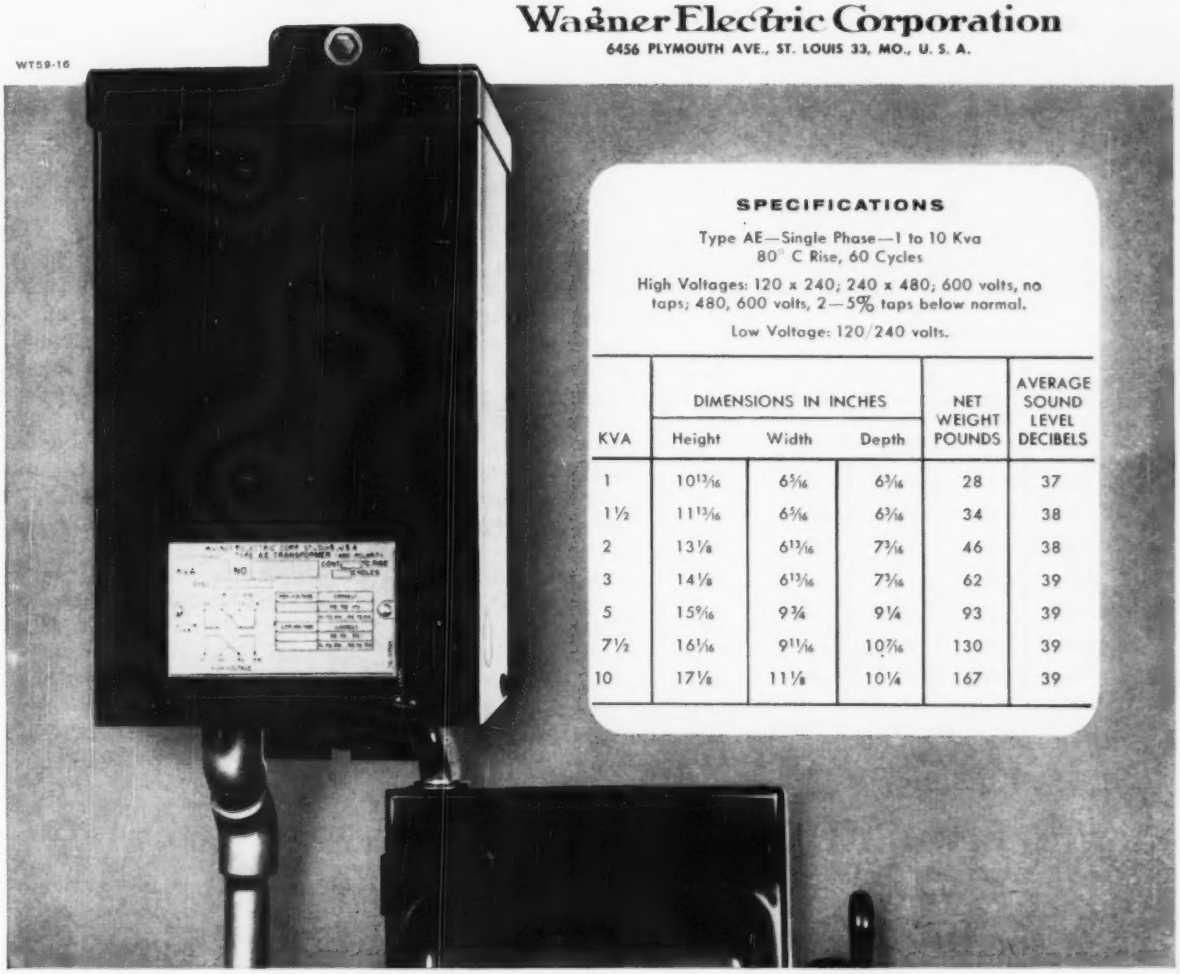
Wagner Type AE transformers do more than silence sound, of course. They improve voltage regulation, and have better insulation protection (suitable for continuous operation at 80°C in a 40°C ambient). All parts are sealed from dust, moisture and corrosion by the epoxy compound. Naturally, every unit is built to conform to all applicable standards of ASA and NEMA.

Wagner Type AE transformers can be installed indoors or out... in any location where they will not be submerged or exposed to injurious fumes in concentration. They are compact and lightweight and can be mounted in any position, at any angle... on walls, floors, or ceilings.

Like to know more? Wagner branches and distributors have all the details. There's one near you. Call or write now.

Wagner Electric Corporation
6456 PLYMOUTH AVE., ST. LOUIS 33, MO., U. S. A.

WT59-16



SPECIFICATIONS

Type AE—Single Phase—1 to 10 Kva
80° C Rise, 60 Cycles

High Voltages: 120 x 240; 240 x 480; 600 volts, no taps; 480, 600 volts, 2—5% taps below normal.

Low Voltage: 120/240 volts.

KVA	DIMENSIONS IN INCHES			NET WEIGHT POUNDS	AVERAGE SOUND LEVEL DECIBELS
	Height	Width	Depth		
1	10 13/16	6 5/16	6 3/16	28	37
1½	11 13/16	6 5/16	6 3/16	34	38
2	13 1/8	6 13/16	7 3/16	46	38
3	14 1/8	6 13/16	7 3/16	62	39
5	15 9/16	9 3/4	9 1/4	93	39
7½	16 1/16	9 11/16	10 7/16	130	39
10	17 1/8	11 1/8	10 1/4	167	39

For faster, better tree trimming with less fatigue

Chance *Power* Pruners

These air-powered pruners make a clean one-stroke slice through green branches up to 2 inches in diameter. No splitting or chewing of branches. Jaws re-open automatically after each cut. These lightweight, well balanced tools are easy to use—require no experience to operate from "buckets," ladders, or in trees.

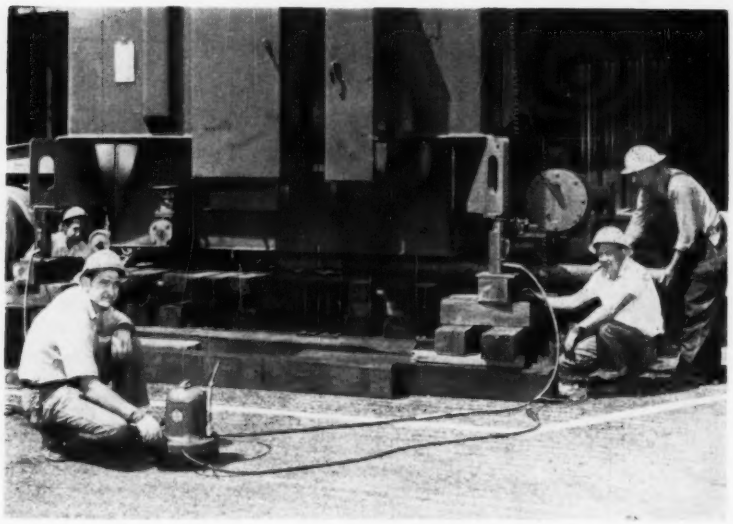
Chance power pruners, guy strand cutters and cutters for electrical conductor are air powered. They operate from many power sources — compressors of any type or standard cylinders of dry nitrogen. Insulated and non-insulated models are available.

A. B. CHANCE COMPANY

CENTRALIA, MISSOURI

A.B. Chance Co. of Canada, Ltd., Toronto

CT59-18A



Raise Transformer with Motor-Driven Jacks

FRANK J. MEYERS, Substation Operating Engineer, West Penn Power Co, Greensburg, Pa.

Motor-driven hydraulic jack equipment is used by the Operating Dept of West Penn Power Co in the movement of large transformers or other heavy equipment when cranes are not available. This equipment provides an additional safety factor in that workmen can stay in the clear when equipment is being raised or lowered.

The jack equipment consists of a Blackhawk electric-driven power pump, four 50-ton portopower jacks, two toe lifts, 12 lengths of oil hose each 6 ft long, and miscellaneous fittings.

The electric-driven pump operates two 50-ton jacks at one time. In either the raise or lower direction, the load is evenly distributed on the two jacks. Collapsed height of the 50-ton jacks is 11 in.; extended height is 17 in. or a raise of 6 in.

When toe lifts are used with the 50-ton jacks, the jacks are derated to 25 tons. The toe of the jack is 2½ in. above the base with the jack collapsed and 8½ in. above the base of the jack in the extended position.

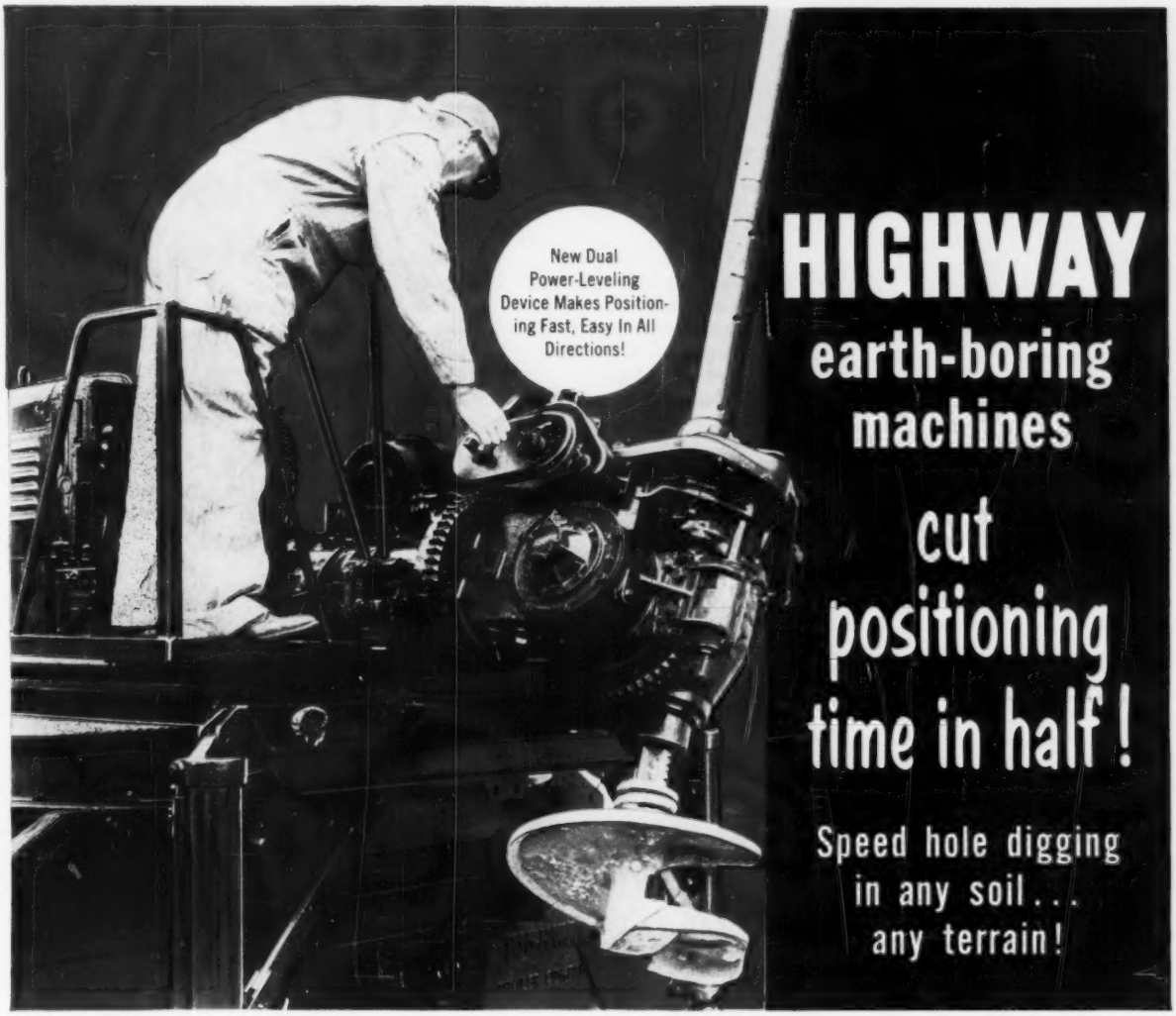
For the raising of a large transformer with jacking pads at each corner, one 50-ton jack is set near each jacking pad. Two 6-ft lengths of oil hose are coupled to each jack and then through a valve to a tee-connection on opposite sides of the transformer.

At one side of the transformer, the oil hose is coupled to the pump and to the open end of the tee. Two or more hoses may be used to position the pump in a convenient place. Because only one side of the transformer is raised at a time, the jacks are placed under the jacking pads on the one side.

The pump is connected to a 110-v single-phase circuit and the jacking and blocking operation on that side performed. Jacking of the other side of the transformer is done by disconnecting the hose at the tee and connecting the hose to the tee at the other side of the transformer. The hose need not be uncoupled from the pump during the transfer.

In setting jacks in position, the top of the cribbing below each jacking pad should be level. Next, a steel plate, supplied with the jacking equipment, is centered on top of the blocks under the jacking pad. Thin pieces of wood should be placed on the plate and between the top of the jack and the bottom of the jacking pad Thin pieces of wood, excellent for this job, can be obtained from insulator or distribution transformer crating.

CIRCLE 111 ON READER SERVICE CARD



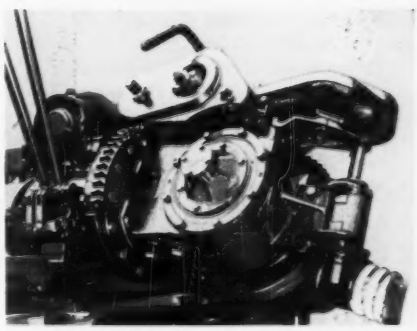
HIGHWAY earth-boring machines cut positioning time in half!

Speed hole digging in any soil... any terrain!

POWER POSITIONING FOR ANY ANGLE UP TO 90° — An easy turn of the power-leveling mechanism puts your rack bar and derrick in the exact position desired. Perfect for work in rough, uneven terrain! Permits fast maneuvering of machine fore and aft and left to right. Makes straight-down digging quick and easy regardless of truck position.

RUGGED CONSTRUCTION plus top engineering mean hundreds of maintenance-free work hours for the Highway Model HDA or Model HDAMS Earth-Boring Machines. Conveniently located power-leveling control at top.

HIGHWAY'S EARTH-BORING MACHINES with power leveling can save you time, money and manpower. Call your Highway representative now!



New power-leveling mechanism now available on Highway's Model HDA and Model HDAMS Earth-Boring Machines.

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MANUFACTURERS LITERATURE

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BREAKERS

BREAKER ACCESSORIES . . . molded case, and modifications. All products illustrated, with text supplemented by outline dimensional drawings. Bulletin GEA-6757, 12 pages. General Electric Co. Distribution Unit, 90 Whiting St, Plainville, Conn. **(21)**

CRANES & HOISTS

HAND CHAIN HOISTS . . . Tables and recommended minimum standards for differential, worm-geared and spur-geared (or equivalent) types. Hook or lug suspension and plain or geared trolley. HMA-200, 8 pages. Hoist Mfg Associates, Inc, One Thomas Circle, Wash 5, D. C. **(22)**

OVERHEAD HOISTS . . . for handling of from 500-lb to 60-ton loads. Covers more than 20 kinds of cranes, hoists, and specialty and accessory items. Photographs and line drawings supplement text. Safety latch, a product recently introduced, converts standard hooks to safety hooks quickly with only hand tools required. Catalog R, 12 pages. The Harrington Co, Plymouth Meeting, Pa. **(23)**

TRUCK CRANE . . . 60 ton, with illustrations of the 700 series crane and close-ups of features. Catalog No. 770-TG-2, 16 pages. American Hoist & Derrick Co, St. Paul, Minn. **(24)**

DISTRIBUTION

CABLES . . . Compresto, neoprene type, polyethylene type and two-coat type. Reel information and tables on bare Compresto characteristics, conductor calculations and conversion. Compresto is available up through 336,400 cir mils with both 19-wire all-aluminum and 18/1 ACSR constructions. For secondary-service cable and spacer-type aerial cable. Catalog, 44 pages. Southern Electrical Co, Chattanooga, Tenn. **(25)**

TRUCK BODIES . . . Standard Bobcat body equipment and optional body equipment listed. Diagrams of typical tool and material layout. Bulletin No. 948, 2 pages. York-Hoover Corp, Body Division, York, Pa. **(26)**

AIR COMPRESSOR . . . fundamentals for air-cooled compressors ½ through 20 hp. Information for selecting small packaged air compressor for automotive or industrial application. Tabular and chart information on volume of air required to operate a variety of pneumatic equipments, average and continuous air supply tables, and cylinder diameters required to develop power to overcome indicated loads. Booklet, Form 1548, 12 pages. Ingersoll-Rand Co, 11 Broadway, New York, N. Y. **(27)**

INSTRUMENTS

LEAK DETECTOR . . . mass spectrometer for locating leaks in vacuum and pressure systems. Operating principles, features, application data. Describes maintenance, installation and consultation services, optional accessories. Bulletin GEZ-2939, 12 pages. General Electric Co, Schenectady 5, N. Y. **(28)**

IMPULSE RECORDER . . . and printer, the Teleprintomaxigraph. Handles 4000 impulses per hr; prints and records power demand values. Features strip chart. Standard integrating periods are 5, 10, 15, 30, and 60 min. Complete construction and operating principle described. Brochure, 8 pages. Landis & Gyr, Inc, 45 W 45 St, New York 36, N. Y. **(29)**

THERMOCOUPLE WELLS . . . and complete assemblies. All data needed to select proper well for any application, plus ordering and pricing information. Catalog G102-1, 16 pages. Minneapolis-Honeywell Regulator Co, Wayne & Windrim Aves, Philadelphia 44, Pa. **(30)**

INSULATION

ELECTRICAL RESINS . . . two methods of encapsulating re-wound electric motors in epoxy resin: the "no mold" system, using a thixotropic resin buttered over the end turns and slot wedges, forming a reservoir into which resin is poured; and the molding process, using a custom-made mold system of Lamicoid canvas-base laminate or other stiff material. Bulletin, 4 pages. Minnesota Mining & Mfg Co, 900 Bush Ave, St. Paul 6, Minn. **(31)**

SILICONE INSULATION . . . "Why and Where It Pays You to Use Cable Insulated With General Electric Silicone Rubber," lists outstanding insulating properties of GE Class 900 electircal grade silicone rubber. Illustrates savings in installation costs through a cost comparison between silicone insulated cable and varnished cambric cable. Also supplies a comparison of properties of silicone rubber, butyl, GR-S, and natural rubber. Bulletin CDS-08, 4 pages. General Electric Co, Silicone Products Dept, Waterford, N. Y. **(32)**

INSULATORS . . . for 600 to 5,000 v, molded from fiber glass reinforced polyester. Heights range from 1⅜ in. through 3½ in. Four insulator series described: 600-v standoff, center-post, corrugated-type apparatus-standoff, and 5-kv standoff. Catalog, 4 pages. Glastic Corp, 4321 Glenridge Rd, Cleveland 21, Ohio. **(33)**

INSULATING VARNISHES . . . with complete details on all electrical and mechanical properties, as well as operating temperature limitations. Charts, graphs, and illustrations on temperature conversion, solvents, specific gravity, viscosity for selection of insulating systems from Class A to F. Catalog E-IVC (891) JR, 35 pages. Minnesota Mining & Mfg Co, 900 Bush Ave, St. Paul 6, Minn. **(34)**

INSULATION . . . varnished Dacron glass tape, currently available on GE's interlocked armor cable,

Seal oil IN! Seal moisture OUT!

with

J-M TRANOLSEAL

developed especially for efficient sealing against

refined oils

You can stop the dangerous and costly leakage of oil from transformers and switchgear with Johns-Manville's Tranolseal sealing compound. This permanently plastic material has a nondrying vegetable oil base. It provides effective sealing action against air (dust and moisture), inert gas, water, 13% NaCl brine as well as medium to high viscosity refined oils. Thus you can also prevent penetration by moisture and other ambient sources of trouble.

Tranolseal has excellent adhesive qualities and will not corrode or deteriorate metals, rubber or plastics. It shows good resistance to weather and aging (both painted and natural) and won't stain. Furnished in 1" diameter beads. For further information write Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit (Toronto), Ontario.

JM

Johns-Manville

SEALING COMPOUNDS

CIRCLE 115 ON READER SERVICE CARD

lead-sheathed power cables, and others. Replaces varnished cambric on interlocked armor cable. New GE interlocked armor cable design also described in Bulletin WC-8319, 12 pages. General Electric Co, Bridgeport 2, Conn. **(35)**

LIGHTING

RELAMPING . . . a plan for users of large quantities of fluorescent lamps. Sample calculations for calculating relamping schedule. Booklet A6832, "Group Relamping Plan," 8 pages. Westinghouse Electric Corp, Lamp Division, Box 388, Bloomfield, N. J. **(36)**

FLOODLIGHTING . . . guides for selection of incandescent or mercury floodlights, general-purpose or heavy-duty types, and for determining number of floodlights required. Also mounting accessories. Bulletin 2719, 15 pages. Crouse-Hinds Co, Syracuse 1, N. Y. **(37)**

ROADWAY LIGHTING . . . all phases of by-pass roadway lighting including new design concept, approach and tunnel lighting, power distirbution system, and luminaire selection. Bulletin, "Bypass Lighting is Different," by Ernest F. Siegel of Green Associates, 6 pages. General Electric Co, Schenectady 5, N. Y. **(38)**

MAINTENANCE

FASTENERS . . . of stainless steel and nylon. Price list and basic data on fasteners as well as stainless steel and nylon. Catalog, 178 pages. Anti-Corrosive Metal Products Co, Inc, Box 1894, Albany, N. Y. **(39)**

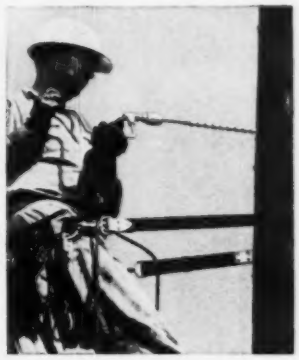
METAL TREATMENT . . . through Ospho, applied directly on rusted metal to stop rust and provide sound base for regular maintenance paint. Also bond between new metal and paint. Folder, 4 pages. Rusticide Products Co, 3125 Perkins Ave, Cleveland 14, Ohio. **(40)**

MANUAL WELDING . . . Heliarc line. Each torch in line illustrated; listing of accessories available. Suitable for manual welding of all commercial metals, ranging from thin-gage to ½-in. thickness. Catalog F-8982E, 20 pages. Linde Co, 30 E 42 St, N. Y. 17, N. Y. **(41)**

(More Literature on page 100)

New Irwin Pole-Bor Bit

gives non-stop boring



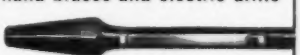
No stopping to clear chips, not even in creosoted poles

Now get easier, faster, non-stop boring action in telephone and power poles with the new Irwin 415T Pole-Bor bit. Chip flow is continuous. Special Irwin cutting head, twist angle, and smooth-polished hollows eliminate clogging and binding — even when boring clean through creosoted poles. Spur on head outlines hole ahead of cutting edge. Side lip then smooths hole, making it easier to insert bolts or pins.

And Irwin's exclusive and patented Adapter Shank chucks perfectly in both hand braces and electric drills to cut inventory costs by 50%, speed work on the job. All Irwin Pole-Bor bits are made of special high analysis steel, heat treated full length and machine sharpened for extra accuracy, longer life. Save time, save money. Order from your Irwin distributor.

Overall Length: Approximately 18", with 12" twist, 6" shank
12 Sizes: 9/16" to 1 3/16"

Irwin Adapter Shank fits both hand braces and electric drills



Comes like this with taper square shank for use in hand braces.

Cut off taper square shank. Use in both hand braces and electric drills. No wobble, no run-out.

IRWIN Wilmington, Ohio

every bit as good as the name

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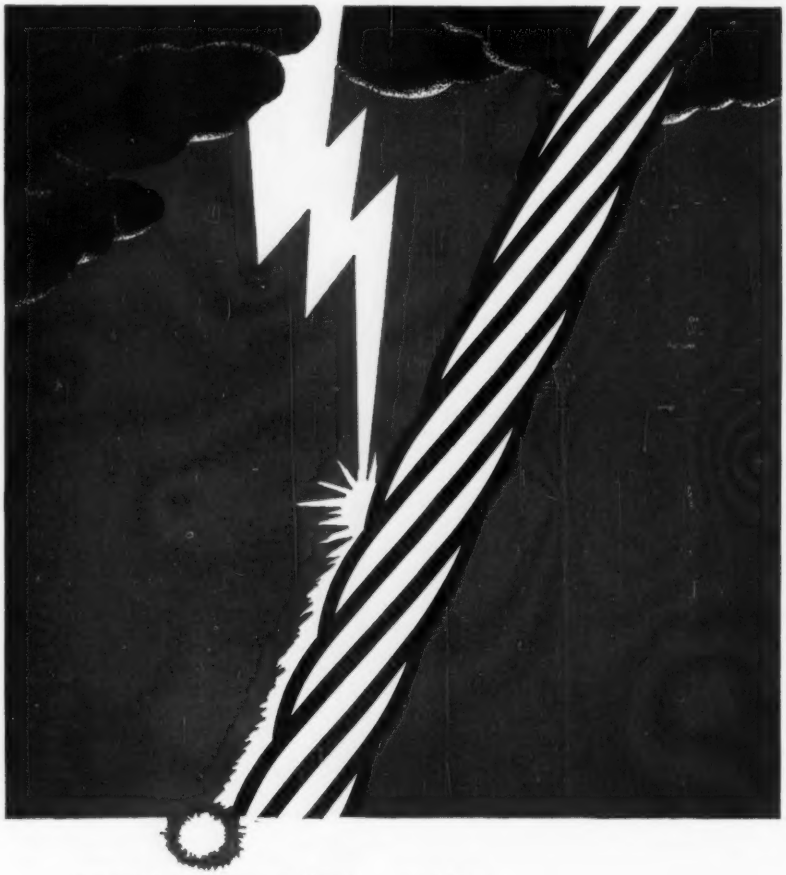

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CF&I Galvanized Steel Strand

The CF&I Image—a giant steelman—stands for the dependability that's built into all CF&I steel products. One of them—Galvanized Steel Strand—is a safe, sure way to ground electrical installations and equipment.

Available in seven- or three-wire constructions, CF&I Galvanized Steel Strand for ground wire is made in accordance with ASTM Specification A-363. In addition, it can be produced to *your particular specifications.*

CF&I Galvanized Steel Strand, (made to ASTM Specification A-122), is also recommended for guy and messenger wire, and is available for quick delivery either from a nearby CF&I warehouse or from your local electrical distributor.

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SUSPENSION SCALE . . . Model P, pertinent dimensions and complete prices on separate card. Accuracy is within 0.1%. Capacity up to 10,000 lb. Bulletin 58E, 8 pages. W. C. Dillon & Co, Inc, 14620 Keswick St, Van Nuys, Calif. **(42)**

METERS

HOOK-ON METER . . . description, specifications and construction details of pocket-sized, hook-on volt-ammeters, Types AK-4 and AK-5, for testing ac voltages. Lists applications, current ranges, accuracy percentage and operating instructions. Folder, 4 pages. General Electric Co, Schenectady 5, N. Y. **(43)**

FREQUENCY METERS . . . Switchboard, miniature and portable resonant-reed Frahm meters in various ranges between 10 and 1700 cps. Includes new ranges, sizes and designs in standard and precision meters, portable and switchboard models 2½ in. to 9 in. in diameter. Bulletin 32, 18 pages. James G. Biddle Co, 1316 Arch St, Philadelphia 7, Pa. **(44)**

MOTORS & CONTROLS

PHASE CONVERTER . . . new, multi-motor, single to 3-phase, Add-A-Phase Type MM. Autotransformer converter operates with a master transformer station and produces over 100% rated power for any or all motors in the system: handles both delta and wye-wound motors. Available in both 220 and 440 v, with master transformer station up to 60 hp and panel controls from ½ to 30 hp. Bulletin 305, 4 pages. System Analyzer Corp, Nokomis, Ill. **(45)**

GEARMOTORS . . . from $\frac{1}{15}$ to 100 hp, integral and all-motor types, including right-angle as well as special designs. Bulletin 51B-9172, 8 pages. Allis-Chalmers Mfg Co, Milwaukee 1, Wis. **(46)**

INDUSTRIAL CONTROLS . . . automatic temperature, pressure, level and flow controls, also counters, switches and automation controls. One section on Hydramotors

(*Continued on page* 102)

ANOTHER WAY RCA SERVES BUSINESS THROUGH ELECTRONICS

BEST BUY IN 2-WAY RADIO!

- COOLER OPERATION
- LOWER BATTERY DRAIN
- NEW CABLING SYSTEM
- 5 WATTS OF AUDIO
- "ROAD MAP" CIRCUITRY
- STANDBY CONTROL
- RCA SERVICE

New RCA Transistorized "Low Drain" Mobile Unit
Greatest Value...in Performance...Service...Price

Looked at from any angle—performance, service, price—the new "LD" (Low battery Drain) 2-Way Radio is sensational news from the leader. Minimum tubes in the receiver, no vibrators in the power supply—they've been replaced by readily available stock transistors for long life and dependability! Transistors used only in circuits where long experience has proven they can give reliable performance. Your RCA representative will be glad to show you why the "LD"—dollar for dollar, feature for feature—is today's greatest 2-way radio value.

Heat drain reduces internal temperature of unit up to 40%, providing longer component life (case has wrap-around heat sink). Standby monitoring feature cuts battery drain to a mere 2¼ amps. With vehicle engine off, radio can be left on to receive incoming messages for long periods without impairing battery life—automotive cabling used exclusively for greater flexibility, positive contact, corrosion resistance. Five watts of audio power for greatest message intelligibility. Equipment easily moved from car-to-car—trunk or true-dash mount. Security sealed circuits clearly numbered to provide "road map" for fast, simple servicing—RCA Service Company technicians available to keep your equipment operating at maximum efficiency.

Mail coupon for further facts.

RCA's FIRST NAME IS RADIO

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☐ Please send me FREE literature on the new RCA Transistorized Mobile Radio

☐ Have RCA Communications Specialist contact me and explain why this is today's best value in 2-way radio

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NEW transformer polarity checker

ACCURATE, PORTABLE, VERSATILE

$50.00

NOW ... check polarity markings on transformers **anywhere.** Unit check over a vast range of transformer sizes simply by adjusting the sensitivity control to the correct current. Operates equally well on small electronic, instrument and metering transformers—both potential and current. Only 3¾" wide, 6½" long, 2⅝" high. Wt. 1 lb. 11 oz.

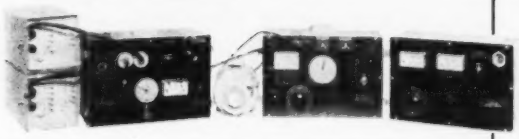
Send for Bulletin No. 107.

EASTERN SPECIALTY CO. / Philadelphia 40, Pa.

CIRCLE 117 ON READER SERVICE CARD

A NELSON FIRST

PORTABLE RELAY TEST UNITS FOR PROPER TESTING & MAINTENANCE OF SWITCHGEAR COMPONENTS



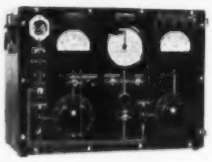
Type RA1-1 Nelson portable test units which may be used in combination for complete testing of switchgear components.

USE NELSON RELAY TEST UNITS TO

- **Improve Operating Performance**
- **Eliminate Excessive "Down-Time" when testing switchgear.**

Up to now a complete rewiring job was necessary to test each different device in a piece of switchgear. Nelson's field service department, working with Nelson's engineering and research departments, has produced a portable relay test unit that will test relays, meters, coils, circuit breakers, etc.

Use Nelson test units to reduce testing time, "down-time" and eliminate much lost production due to present testing methods.



Type RD1-1 Nelson portable test unit for simple testing of meters, protective relays, overload heaters, tripping coils, etc. For use with AC circuits only.

A major source of Electrical Control Equipment for Industry

Write for Bulletin 774

NELSON Electric MANUFACTURING CO. TULSA, OKLAHOMA

Industrial Controls

(*Continued from page* 100)

—electro-hydraulic actuators—with many patterns, designs, and valve body materials. Includes the Hammel-Dahl Division and Foster Engineering Division lines, also relays, transformers and time switches. Catalog. General Controls Co, Literature Control Section, 801 Allen Ave, Glendale 1, Calif. **(47)**

MOTOR STARTERS . . . 15 hp, 440-500 v, magnetic type, incorporating many new control features. Field modification kits described. Encapsulated dual-voltage magnet coils, rated 110-220 or 220-440 v, 50-60 cycles, are moisture and fungus resistant. Catalog 14-B1, 16 pages. Furnas Electric Co, 1026 McKee St, Batavia, Ill. **(48)**

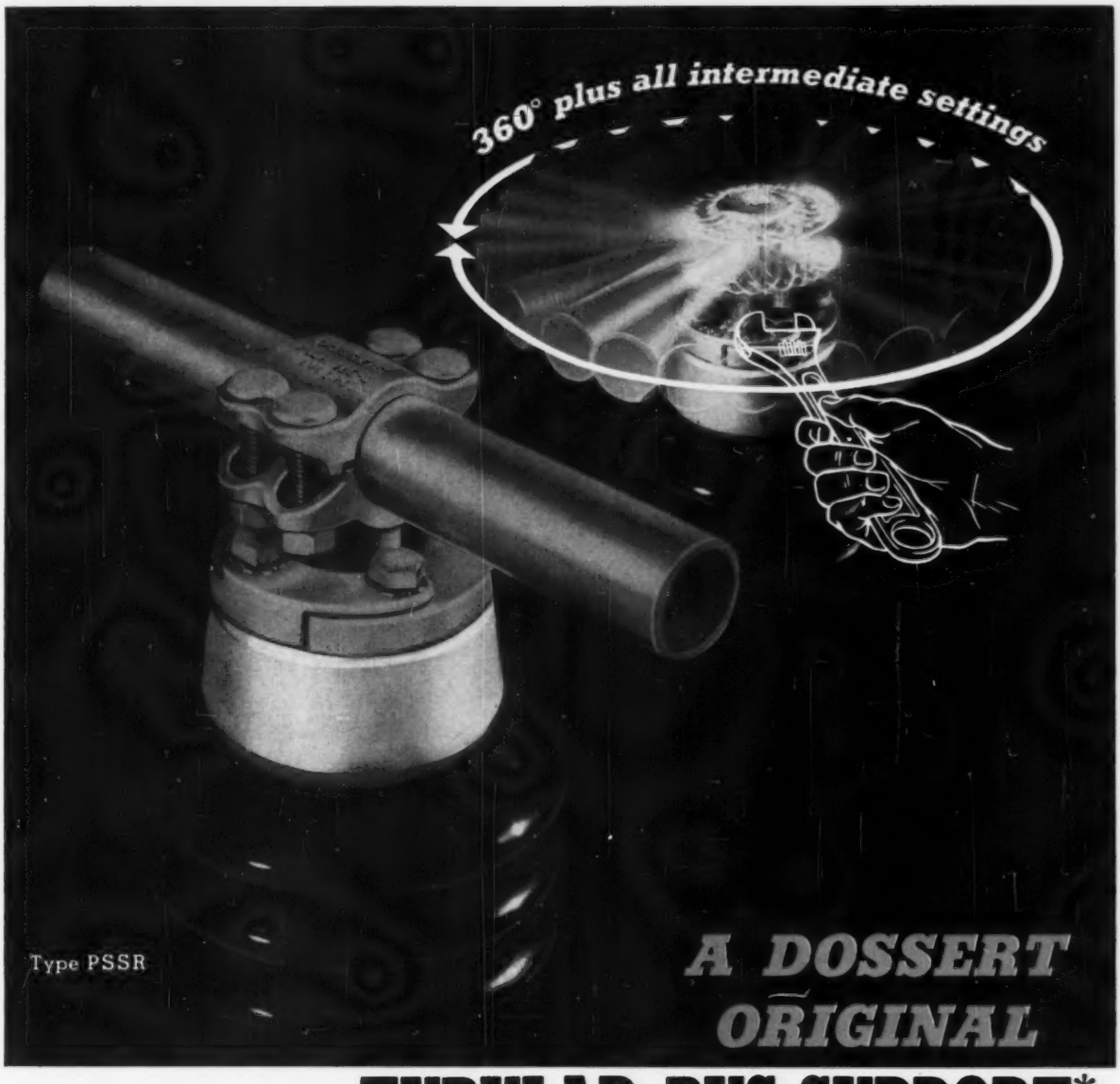
DUST CONTROL SYSTEM . . . the Deynor "wet water" fly ash and dust control system for utility and power plants. Manually operated or fully automatic, adaptable to large and small plants. Blue print of typical installations. Brochure, 4 pages. Deynor Data 66B. Deynor Corp, 1 Depot Plaza, Mamaroneck, N. Y. **(49)**

GATE VALVES . . . iron body. Service ratings, sizes, dimensions, and material specifications. Section devoted to higher strength cast iron wedge gate valves which carry steam, water, oil, and gas. "8-in-1" design. Circular, 5 pages. Walworth Co, 750 Third Ave, New York 17, N. Y. **(50)**

SOLENOID VALVES . . . Engineering information and selection guide for new ASCO solenoid valves with illustrations and flow diagrams. Catalog, 16 pages. Automatic Switch Co, Florham Park, N. J. **(51)**

RELAYING

TRANSCEIVER . . . Type CS-16, 10-w, transistorized, carrier-current model is designed for use with static phase comparison relaying devices. It also handles other applications requiring high-speed impulse transmission, such as supervisory control with selected telemetering. Bulletin ECC 109, 8 pages. General Electric Co, Communication Products Dept, Lynchburg, Va. **(52)**



fully adjustable, TUBULAR BUS SUPPORT*

This bus support, made of high-strength bronze throughout, has the following outstanding features:

- Fully adjustable to any angle whatsoever within a complete circle (360°).
- No need to lift bus out of support to change angular position.
- To change position within seconds, merely loosen 4 insulator mounting bolts, rotate assembly to desired angle and re-tighten bolts.
- No inaccessible internal bolt employed for angular setting.
- The only bus support whose angular adjustment does not jeopardize its overall strength.
- By reversing cap bus can be tight-mounted or slip-mounted.

Write for illustrated brochure!

*U. S. PAT. 2,861,762

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IMPORTANT PIONEERING DEVELOPMENT!

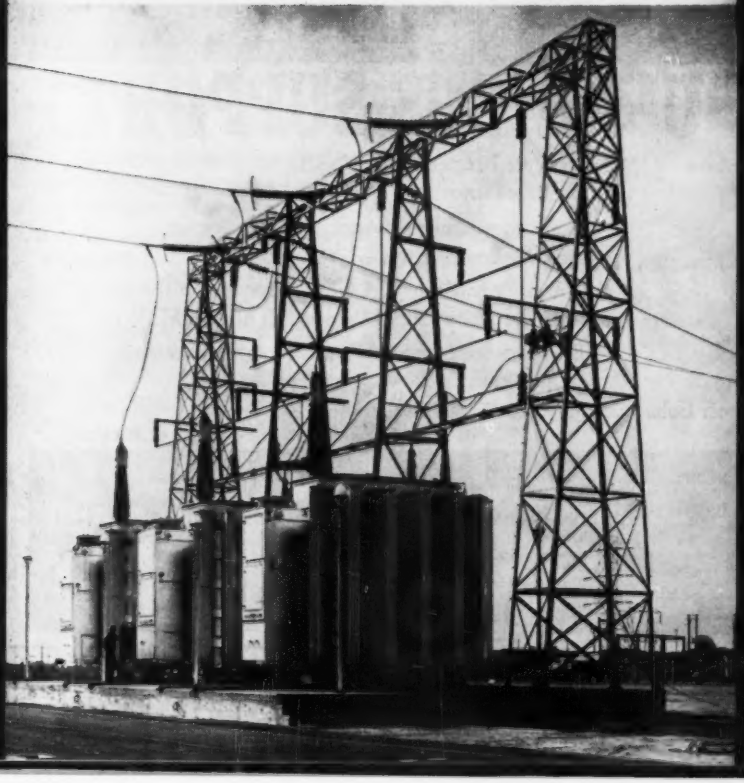
new protection for steel and aged galvanized iron!

reduces maintenance costs more than 30%!

Eight-year test on transmission towers conducted in cooperation with a large power company led to discovery of the superior durability of this new protective paint. New Vita-Var Stainless Steel Paint #13448, permits substantial savings where exposure is in normal or corrosive industrial atmosphere. Provides years of additional service, reducing labor expenditure substantially.

VITA-VAR®

STAINLESS STEEL PAINT #13448



CONTAINS STAINLESS STEEL FLAKE
(18% Cr, 8% Ni) Combined with non-metallic pigments

- Has life expectancy of more than 12 years.
- Resists corrosion
- Has extreme durability.
- Practically no deterioration under severe corrosion conditions.
- Ultra smooth surface, sheds dirt and dust.
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- Brushes, rolls or sprays on easily. Levels well. Cuts painting time and costs.
- Finish becomes lighter and brighter.
- Slow rate of chalking adds to durability.

MANY OTHER VITA-VAR FINISHES ARE MADE FOR USE IN THE ELECTRICAL POWER FIELD

TRANSMISSION FINISHES for use on weathered galvanized iron, transmission towers, substation structures, fences and corrugated buildings.

ELECTRICAL EQUIPMENT FINISHES for use on transformers, oil circuit breakers, street lighting standards, oil storage tanks, cabinets, capacitor and switch gear apparatus.

COAL CONVEYOR PAINTS for exterior use on any surface exposed to the corrosive action of acid, alkali, moisture, weathering, fumes and abrasive action of coal.

For further information write:

VITA-VAR® CORPORATION

NEWARK 2, NEW JERSEY

Paint Engineers Since 18

Guards Protect Against Electric Shock

To protect against the hazards of electric shock while cleaning energized conductors with wire brushes, two guards have been developed by Warren T. Stolicker and Elwin R. Wiley of the Lansing Division, Consumers Power Co. These Masonite presswood guards protect rubber gloves from damage by wire brushes and thus protect against shock.

When cleaning conductors and applying protective greases, it is possible for the wire brush to penetrate the leather protector glove and the rubber glove. If the grease is applied during the brushing operation, the grease often gets smeared onto the gloves.

A "hand guard", which fits over the conductor to protect the left hand, consists of a 5x5x⅛-in. piece of presswood with a ¾-in. slot to the center. A rubber handhold on the guard consists of a 5x5½-in. piece of ⅛-in. rubber bolted to the presswood.

A "brush guard" consists of a 3x3-in. piece of presswood drilled to fit the removable Blackburn WB-1 brush. Guards are used while cleaning and applying protective coatings to conductors at clamp and splice locations.

Break Meters Safely in Rubber Protector

F. G. KNAPKE, Supervisor, Electric Meter Dept, Cincinnati Gas & Electric Co, Cincinnati, Ohio

Use of a rubber protector has proven very successful in eliminating the hazard from flying particles when "junk" watt hour meters are broken. The protector has not appreciably increased the time required to perform this operation.

Watt hour meters are scrapped at Cincinnati Gas & Electric Co by striking each meter with a large sledge hammer. Even though all glass covers are removed and the man wears the required safety equipment (goggles and gloves), there is danger that parts of the meter broken off by the impact may strike the operator or someone in the area.

To overcome this danger, a protector is placed around each meter before it is struck. The protector is made of a ⅛-in. rubber mat formed into a hollow tube 11 in. in diameter and 9 in. high. It is held rigid by two rings of No. 9 iron wire placed ½-in. and 4½-in. from the bottom.

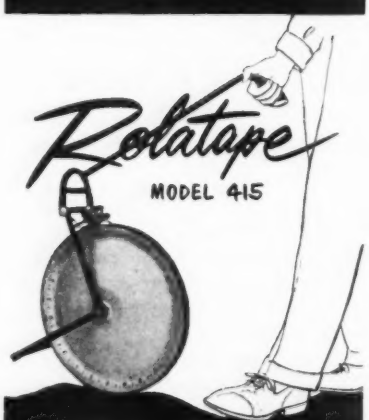
(More Safety on page 106)

←CIRCLE 104 ON READER SERVICE CARD

It's New!

NOW–AT LAST A MEASURING WHEEL THAT MEASURES ACCURATELY TO A FRACTION OF AN INCH!

Rolatape's amazing new Model 415 meets all your measuring needs — measuring quickly and surely over the most uneven and irregular terrain with no risk of human error. This time-saving instrument is calibrated to measure accurately in full view of operator as it is rolled along, giving measurements in inches (to ½ inch) on one side of measuring wheel, and tenths of a foot (to .5 of a foot) on the other. Sturdy and lightwight, it is equipped with automatic brake and built-in stand. Handle folds compactly. See one at your dealer's today.



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SEND TODAY FOR FULL DETAILS

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ROLATAPE Inc.
1741 14th Street,
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Send me free details on ROLATAPE:

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Pistol and Perfume Discourage Dogs

GEORGE T. SMITH, Gulf States Utilities Co, Beaumont, Texas

Gulf States Utilities' Safety Department has been experimenting with a new approach to the problem of meter readers being menaced by dogs. The department has found that spraying a cheap perfume with a water pistol will discourage "fido." Most perfumes obtained from the variety stores seem to be effective; an ordinary child's water pistol can be used.

Quiets Barking Dogs

In most cases observed, dogs sprayed are willing to give the meter reader a wide berth. Spraying also has been effective in quieting barking dogs, as well as those that maliciously or inquisitively charge a person.

However, there are some shortcomings. Toy guns do not expell perfume far enough. Should a really vicious dog charge, the meter reader cannot "stand off" the animal, read the meter, and record the reading with only two hands.

Perfume spraying is not a positive "cure-all" for dog bites. However, it does show promise of substantially reducing the number of attacks suffered by meter readers.

SHAW-PERKINS COOLING RADIATORS

. . . properly designed to cool power and distribution transformers

Designed and built by the pioneers and specialists in economical, dependable self-cooling methods. Sizes and models for any make transformer. Valves, flanges, elbows available. Transformer tanks built to customer's design.

Write for full information. SP-11

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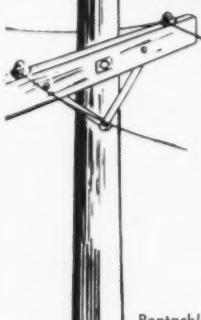
CIRCLE 119 ON READER SERVICE CARD

Haley's



CEDAR POLES • FIR CROSS ARMS

Pentachlorophenol Treated — protected against decay, moisture and insect damage, and will give long service life. Thoroughly tested and approved by leading public utilities as standard construction.

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R. G. HALEY & CO.
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If you are not already an Electrical World subscriber, but would like to get the "Electric Utility Methods" Special Reports, just fill out the return card on the opposite side of this page and we'll reserve them for you. All 6 1960 reprints for only $1.00!

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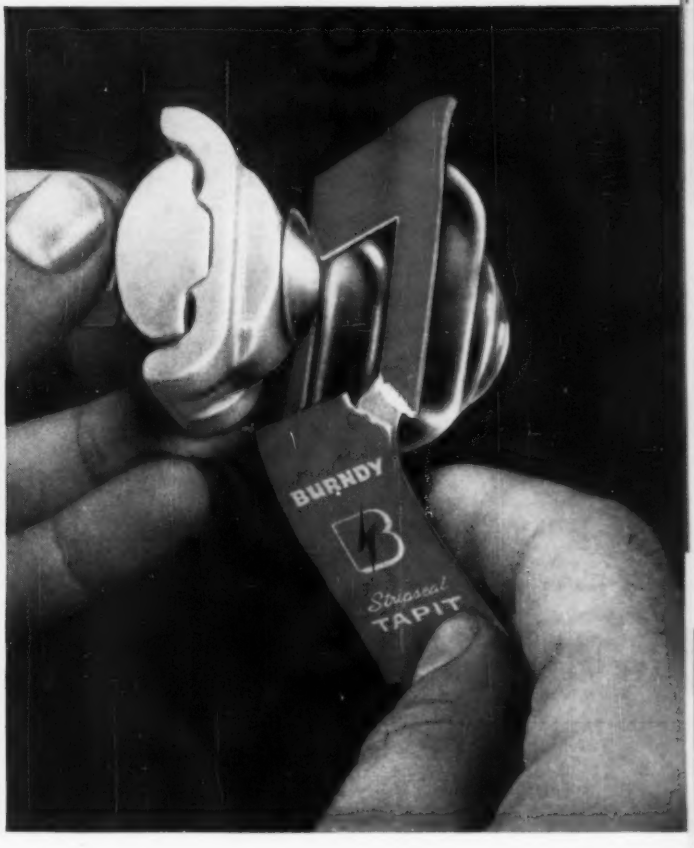
seals in oxide-inhibiting PENETROX®
...on the connector contact surfaces



No Cutting...No Snipping or Ripping...Just a Gentle Pull

TAPIT® with STRIPSEAL makes neat, clean aluminum-to-copper connections.

and your Burndy STRIPSEALED connector is ready to make a trouble-free aluminum connection. STRIPSEAL, the leak-proof, all-weather, plastic cover hugs the connector like a "cocoon"...seals in oxide-inhibiting PENETROX—on the contact surfaces, where it belongs. **It's easy to use**...even with work gloves on. **It's clean** ...just dry brush conductor and install the connector; no on-the-job application of oxide inhibitor needed. **It's sure**...lineman can't forget PENETROX. For positive protection of every connection, specify Burndy connectors with STRIPSEAL. Write for full details.

BURNDY

59-18

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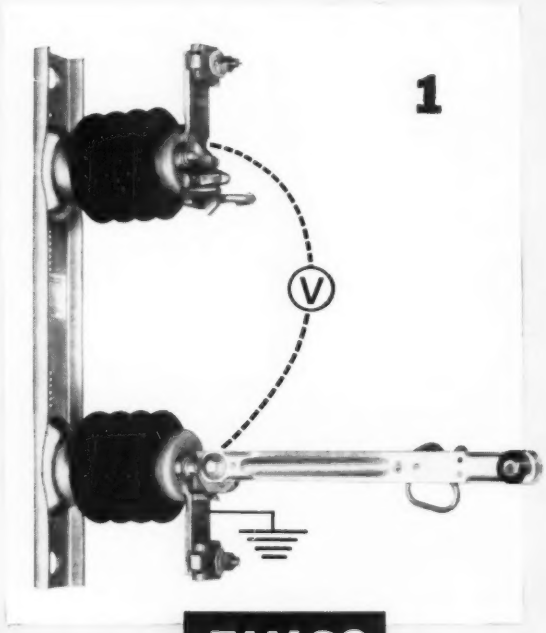
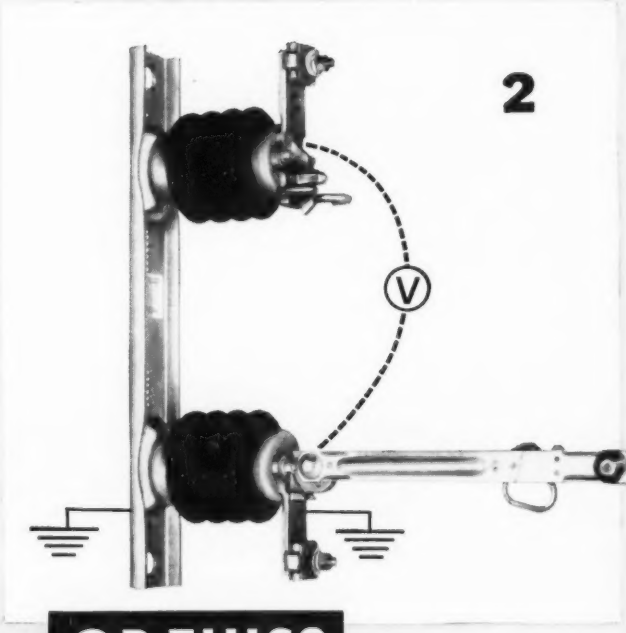
CIRCLE 109 ON READER SERVICE CARD

Q: Which Test Shows a 95 Kv impulse withstand for S&C's 15 Kv LOADBUSTER DISCONNECT?



THIS?



OR THIS?

A: *Both confirm 95 kv for S&C's* LOADBUSTER DISCONNECT.

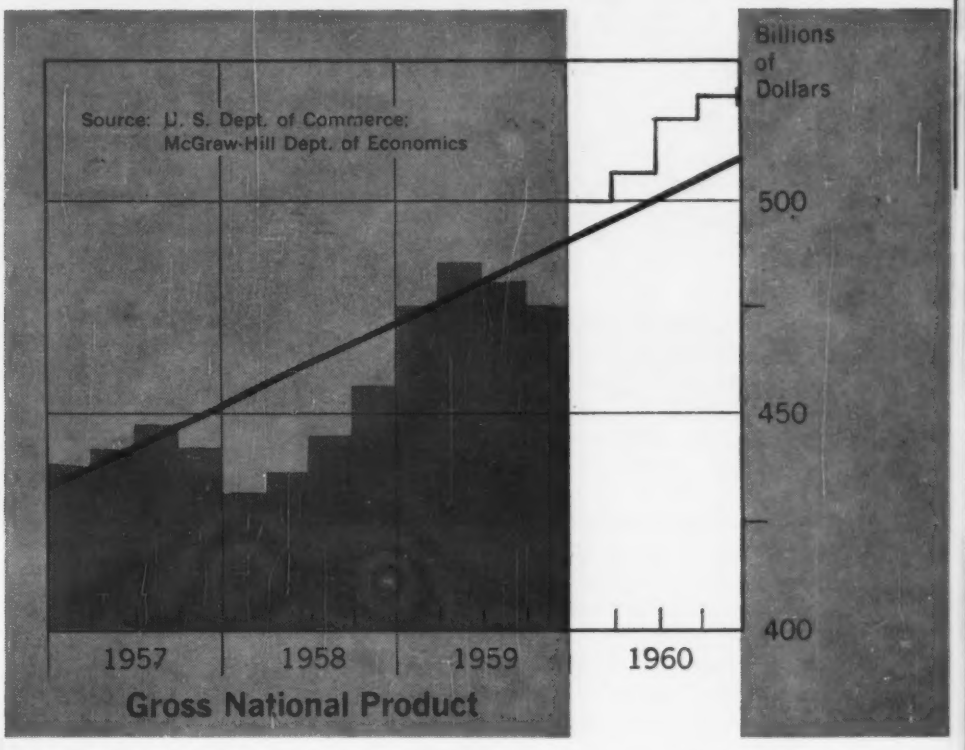
Test 1 is a less rigorous test. With the base "floating," conventional disconnects can often meet the 95 kv test. But this is an unrealistic condition, for in actual installations the base may be grounded . . . deliberately or not. A disconnect may be mounted on steel, or—even if on a crossarm—wet weather may wash out the "margin."

Test 2 with *base grounded* presents two parallel paths to ground. Under this severe condition S&C's Loadbuster Disconnect meets a full 95 kv impulse withstand.

There are no established AIEE or NEMA standards for this class of disconnect. Nonetheless for lineman safety S&C chooses to meet test 2, another "extra" at no extra cost.

Descriptive Bulletin 721 gives the full story on this remarkable disconnect. Bulletin 721 tells, too, how you can get low-cost load switching anywhere on your distribution system by using this disconnect with LOADBUSTER (the portable loadbreak tool). Write to S&C Electric Company, 4421 Ravenswood Avenue, Chicago 40, Ill.

S&C ELECTRIC COMPANY



Report on
Electrical Business Outlook

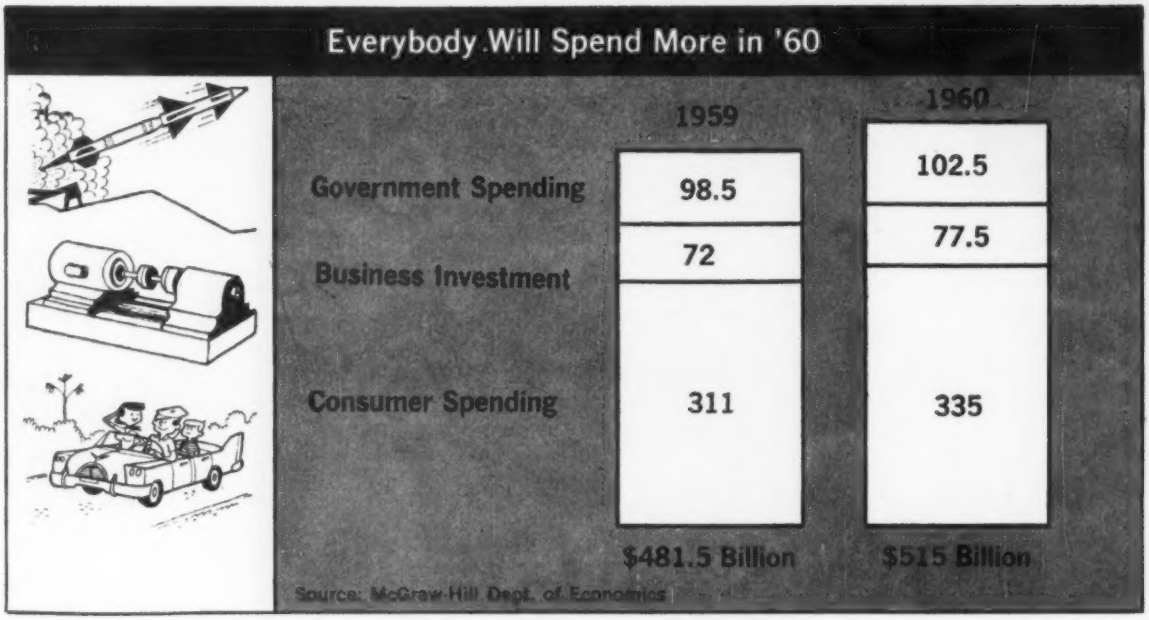
Back to the Trend Line in 1960

From almost every angle, 1960 looks like a boom year for business. About a year ago, it appeared that 1959 might be the year when business would recover the losses of the recession and climb back up to the trend line of post-war growth, which has averaged about 3.6% per year. The steel strike doused such hopes for 1959, but it also deferred so much activity over into 1960 that next year can hardly miss going into the books as a real boomer, erasing the last marks left by the recession on the long-term growth picture.

1959 was a good year in spite of the steel strike, so that 1960 is starting out on a fairly high level. Before the strike (and partly because it was expected) the economy soared to record levels. Gross national product (the nation's total dollar volume of business) reached a peak annual rate of $485 billion in the second quarter. But the steel walkout knocked business back below the trend line. The fourth quarter is winding up with GNP at about a $475-billion rate.

GNP will pass the half trillion mark early in 1960, unless the steelworkers go out again in January for another long stretch. Assuming that this does not take place, business will continue at a high and rising level throughout the year. Total gross national product for the year will run around $515 billion. This is primarily because the shortage of steel has pushed forward the dates when key industries such as autos and capital goods can reach peak production. Activity in the steel industry itself adds further strength to the picture. Only the chance of more labor trouble (notably a railroad strike) mars the outlook. Although it is still caught between tight money and inflation, business seems strong enough to grow rapidly in spite of their effects.

The whole economy will participate in the boom in 1960. The average American will earn more, and he will spend more. All levels of government—federal, state,



and local—will up their budgets. Business will spend more for new plant and equipment and will be building inventories.

Business investment is expected to run about $5.5 billion higher in 1960 than this year. Most of this will be due to rising capital expenditures. McGraw Hill's preliminary survey of business' spending plans in October showed that firms then planned to increase spending by $3.5 billion—or about 10%. But the usual upward revisions in plans will probably add another $1 billion increase as final budgets are approved. Early plans were especially shaky this year because of steel shortage and uncertain construction schedules.

Inventories will be rising all next year. This year was marked by a steep buildup in the first half followed by a precipitious drop in the fourth quarter, with the net effect for the year being a $4 billion rise. Next year's buildup should be continuous and strong—stocks are now depleted and business is expanding—and the net for 1960 will be close to $7 billion.

One of the few weak spots in business investment, or in the whole economy for that matter, is residential construction. It will probably decline about 10% from this year's record level, due to tight money. In other areas of business investment, farm investment will probably drop as farm income continues to decline, while capital spending by professional men and non-profit institutions will rise slightly along with the general improvement in business.

Government spending will rise by $4 billion in 1960, to top $100 billion for the first time in U. S. history. This year the combined total expenditures of the federal, state and local governments amounted to $98.5 billion. Next year they will come to about $102.5 billion. Federal spending will rise moderately, but most of the rise will come in the state and local sectors.

State and local governments will spend about $3 billion more in '60. This year a sharp cutback in federal funds for the highway program caused the states to reduce their own spending. Next year should see more. Next year will also continue the rising trend of hospital and school construction, while state and

municipal employees not only continue to increase in number but also are being paid higher wages for their services.

The fact that 1960 is an election year could affect federal spending during the next fiscal year, beginning July 1. Congressmen will be eager to pass public works measures sought by their constituents, and there's likely to be more pressure for higher federal housing expenditures in the new session of Congress. Then too, the President's veto may be less effective in holding spending down during his last year of office. As for defense spending, no amount of Russian peace talk is going to reduce it much unless it is accompanied by more tangible evidence that war is out of the question. This will not affect next year's budget, and defense spending will probably remain at about this year's level.

Consumer spending will rise by about $24 billion in 1960, powered by a 7% gain in disposable income. Next year's consumers will have more to spend per capita than ever before, and there will be more of them. Total employment will be up about one million over this year. Average weekly earnings will be higher, too; not only because of rising wage rates, but also because the economy will be humming to make up for production lost during the steel strike, and this will keep many paychecks swollen with overtime pay.

The consumer is becoming more optimistic, according to recent surveys, and this bodes well for sales of durable goods, such as automobiles and appliances. Since many auto purchases were deferred in the last quarter of this year because buyers couldn't get the models they wanted, 1960 will probably turn out to be the biggest auto sales year ever. Appliance manufacturers expect an 8% increase in physical volume of sales in 1960. And there's little doubt that next year will see a new peak in installment credit to finance durable purchases.

The continued gain in appliance sales will offset the decline in home building in the utilities' residential sales, which are due for a 9.5% rise in 1960. Commercial construction will still be booming, pushing commercial kwhr sales up about 8%. Industrial sales, the biggest part of total kwhr sales, will reflect the booming 1960 economy with a 12.5% rise.

Here's the Outlook for Eight Large Industrial Kwhr Users:

Steel: Production of ingots and castings is due to rise by 40% to 128 millions tons—eclipsing previous peak by 10%. The steel industry plans to increase its capital spending next year by about 75%.

Aluminum: Domestic primary production will be up 12% in 1960. All major users except residential construction are expected to require increased tonnages, and use by the auto industry especially will soar.

Autos, Trucks, Parts: Car production is due to rise by 37%; truck production, by 7%. Industry experts expect a 7¼-million-car year, with domestic makes accounting for 6.8 million sales.

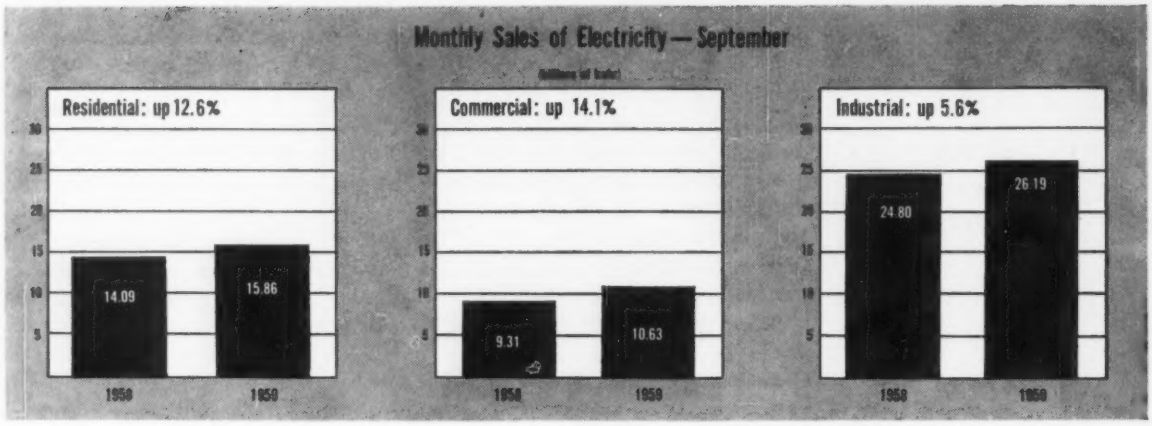
Chemicals: Another 10% increase in output is in prospect for the booming chemical industry, which rang up a record in 1959. Capital spending is due to rise by 24%, including record modernization expenditures.

Paper & Pulp: Manufacturers forecast a 6% increase in volume of shipments for 1960, with converted paper products the biggest gainer. Modernization outlays will rise by more than 30%.

Stone, Clay, Glass: Overall output will be up 7% next year, in spite of declining residential building. Glass shipments are due for a 10% gain. The industry's modernization program will proceed rapidly.

Textiles: A rise of about 5% is forecast for the textile industry next year, sparked by higher industrial demand—particularly from the auto industry.

Machinery: A rise of 11% is expected by manufacturers of non-electrical machinery, as steel becomes available. New orders are on the rise, and increasing capital spending plans of other industries seem to assure crowded production schedules for most of the year.



Power Statistics

		Latest Month	Year Ago	Annual Change %
Capacity	Sept.	154.52	136.99	12.8
Peak—Class I Systems... million kw	Dec.	107.1	102.4	4.6
Estimated Dec. '59 Peak	Sept.	125.0	127.4	−1.9
Production—billion kwhr	Sept	58.58	53.99	8.5
Hydro		10.26	10.74	−4.5
Fuel		48.32	43.25	11.7
Sales—billion kwhr	Sept.	55.93	51.15	9.3
Residential		15.86	14.09	12.6
Commercial		10.64	9.32	14.2
Industrial		26.19	24.81	5.6
Other		3.25	2.94	10.5
Fuel Consumption	Sept.			
Coal—million tons		13.21	12.34	7.1
Oil—million barrels		5.85	6.43	−9.0
Gas—billion cu ft		169.49	141.68	19.6
Net Income Class A & B Co's—$ million	Sept.	140.20	130.15	7.7
Residential Customers—millions	12 mos.	48.65	47.48	2.5
Revenue per kwhr	ended	2.51¢	2.53¢	−0.8
Avg kwhr per customer	Sept. 30	3,517	3,331	5.6
Avg annual bill		$88.28	$84.27	4.8

Business Statistics

Indexes: 1947–49 = 100				
FRB Industrial Production	Nov.	150	144	4.2
ENR Construction Cost	Dec.	169.5	162.2	4.5
BLS Cost-of-living	Oct.	125.5	123.7	1.5
New Orders for Machinery (1950 = 100)	Oct.	166	146	13.7
NEMA Sales				
Insulation materials	Sept.	160	124	29.0
Electric appliances		116	112	3.6
Wholesale prices				
Motors and generators	Sept.	144.8	146.8	−1.4
Transformers and regulators		149.7	148.8	0.6
Switchgear and fuses		178.7	172.1	3.8
GNP—annual rate—$ billion	3rd qtr.	478.6	444.0	7.8

Significant changes: Although the FRB's index of industrial production fell to 150 in November, it gained a point on a seasonally-adjusted basis, reflecting the resumption of steel production.

from Sangamo Electric:

An interim report to the Electric Utility Industry on your response to our question . . .

GLENN M. DeKRAKER
Assistant Marketing Manager

Why Call it Demand?

Does the word "demand" make you bristle?

While we all know that demand charges are fully justified from the standpoint of basic economics, the electric power customer often fails to realize that it is he who is making demands on the utility rather than the other way around. If psychology has a place in rate-making, should the word "demand" have ever been admitted to the electric utility vocabulary?

Electric customers, tabbed with a *demand* charge on their electric bills, have a tendency to bristle at the term.

If we remove *d* metering, it b concept . . . an and less offe as load, ne

Recently, in an advertisement, we questioned the use of the word "demand" applied to the measurement of power usage. The point was made that it is time for all of us to reconsider our use of the word, and asked for your opinions and suggestions about what to do with this thorn-in-the-side term.

Many of you have taken time to write us. We've heard from utilities, editors, and manufacturers throughout this country, Canada and South America. Some of you went to great lengths to express your preferences for a new term. Most all of you who wrote agreed with us . . . it's time to take the "demand" out of demand metering and substitute some term that is less offensive and more easily understood.

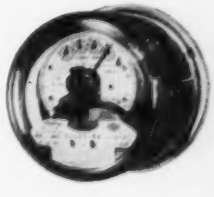
So far, you've suggested 43 different words or terms which you believe will do a better public relations job than "demand." "Capacity" is the word you mentioned most often, followed by "load peak" and "load," then by "maximum load," "use," and "capacity charge." Suggestions are still coming in.

If you haven't already written us as to your suggestion, we would like to hear from you.

Regardless of what you call "demand" measurement, you can depend on Sangamo Meters to do it better.

Sangamo offers the most complete line of demand* measuring instruments in the industry . . . equipment to indicate and record demands from the smallest values to the largest encountered by the electric power industry. The line includes singlephase and polyphase Type D mechanical demand registers, Lincoln indicating and graphic demand meters, digital demand recorders and translating systems for Kw, Kvar, and Kva demand. You can look to Sangamo for all types of demand measurement.

*Until all the returns are in, and you've selected a new term.



SANGAMO ELECTRIC COMPANY, Springfield, Ill.

JM 59-10

News About People

Burnett Elected VP of SEGCO

Andrew E. Burnett has been elected a vice president of Southern Electric Generating Co. He is the company's operating manager.

Burnett joined SEGCO two years ago. Previously he had served as manager of employee relations for Alabama Power Co and had held various engineering and operating positions with that company.

A 1930 graduate of Alabama Polytechnic Institute, Burnett has a master's degree from Massachusetts Institute of Technology.

EIC Names Vaughan Executive VP

Ebasco International Corp has made Fort F. Vaughan executive vice president. A former EIC vice president, Vaughan will continue as company director.

He has been with the American & Foreign Power Co, Inc, of which EIC is the service subsidiary, for 36 years, fulfilling assignments in construction, engineering, operations, financial and legal fields.

A member of the New York State Bar, Vaughan is also a member of the American Institute of Electrical Engineers and is a registered professional engineer.

WHY G-E UNIT-CONSTRUCTED ARRESTERS ARE THE KEY TO REAL DOLLAR SAVINGS

by E. J. ALLEN, General Electric's Supervisor of Station Equipment Sales

Substantial savings can be realized by the elimination of "complete arrester" inventories. And only unit-constructed arresters make these savings possible. Utilities who stock spare "complete arrester" poles of several ratings can reduce their inventories by stocking only appropriate ratings of the unit-constructed General Electric station-class arrester.

THREE BASIC UNITS of the Form 3K arrester, available from factory and district stocks, provide all necessary "building blocks." These single, easily-handled units can be readily added or removed to change arrester ratings. For example, when increasing a 138-kv grounded neutral system—using an "80 percent" 121-kv arrester—to a 230-kv grounded neutral system—using a "75 percent" 182-kv arrester—you need add only one 60-kv Form 3K arrester unit and grading ring.

ONLY THE G-E MAGNE-VALVE station-class arrester combines the advantage of rugged unit construction and built-in anti-contamination feature with service-proved Magne-valve electromagnetic principle of arc interruption. And, of course, modern Thyrite* station-class arresters can be "hot-washed" with hose or spray systems.

For complete details contact your G-E Representative or write Section 435-20, General Electric Company, Schenectady, N. Y.

*Reg. Trademark of the General Electric Company.

GENERAL ELECTRIC

General Electric unit

Lindell Becomes VP at S&C Electric

S & C Electric Co has separated its research and engineering operations. Sigurd I. Lindell will be vice president of the research and engineering functions.

The research unit will develop S&C's basic knowledge in the high-voltage circuit interruption field, and will create prototypes which the engineering section will carry into full production. The latter division will also develop and design new orthodox-type products and will maintain production standards.

Charles H. Baker will be engineering director. John J. Mikos becomes research manager, and Harold H. Fahnoe will be engineering manager.

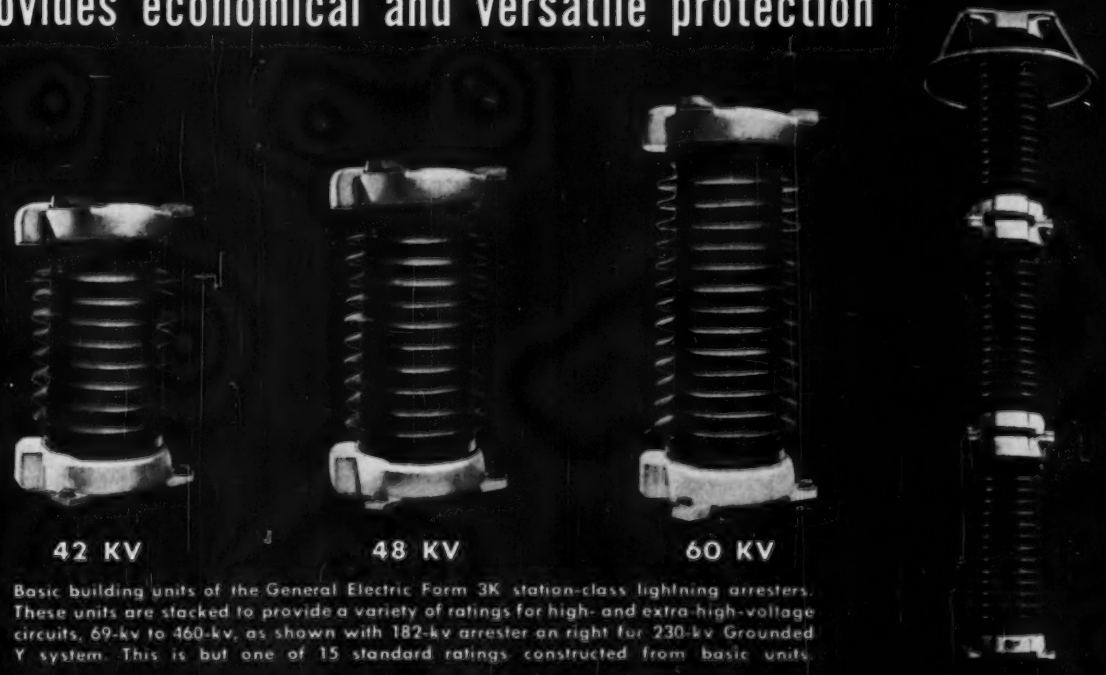
New York State E&G Names Hasbrouck a VP

Kenneth W. Hasbrouck has been named vice president of the New York State Electric & Gas Corp. He will continue to direct the company's rate and regulatory matters, responsibilities which he assumed last February.

Hasbrouck joined the corporation as a cadet engineer in 1926. He became assistant to the Geneva division manager in 1931, went to Oneonta the following year as assistant to vice president in charge of regulatory matters. He held this position until becoming an assistant vice president.

(*More News About People on p* 118)

construction of station-class lightning arresters
provides economical and versatile protection



42 KV 48 KV 60 KV

Basic building units of the General Electric Form 3K station-class lightning arresters. These units are stacked to provide a variety of ratings for high- and extra-high-voltage circuits, 69-kv to 460-kv, as shown with 182-kv arrester on right for 230-kv Grounded Y system. This is but one of 15 standard ratings constructed from basic units.

GENERAL ELECTRIC

GE Transformer Division Gets New General Manager

Robert L. Gibson has been appointed general manager of the General Electric Co's Transformer Division, in Pittsfield, Mass. He succeeds Ray W. Smith, who has resigned.

Gibson has been with GE since 1925. He has served as manager of the Market Research Division of the publicity dept, assistant to the vice president in charge of public relations, and as advertising and sales promotion manager of the chemical dept.

In 1948 Gibson became manager of the Plastics Division of the chemical dept, and became general manager of the department the same year. He was subsequently appointed general manager of the department in 1951, and in 1954 he was named general manager of the Chemical & Metallurgical Division and was elected a vice president of the company.

Dr Charles E. Reed will replace Gibson as general manager of the Chemical & Metallurgical Division.

PERSONAL BRIEFS

John L. Blank has been promoted to the position of manager of Central Illinois Public Service Co's purchasing and stores dept.

New York City's Chapter of the New York State Society of Professional Engineers has presented its 1959 awards for distinguished service to **Frederick C. Gardner,** president of Ebasco Services, Inc, and **Max H. Foley,** chairman of the city's Board of Standards and Appeals.

Gordon L. Coltrin, supervising civil engineer of Pacific Gas & Electric Co, and **J. George Thon,** manager of hydro engineering of Bechtel Corp, have been awarded the 1959 Thomas Fitch Rowland Prize from the American Society of Civil Engineers for their paper, "Morro Bay Steam-Electric Plant."

Arkansas Power & Light Co has promoted **A. B. Coen, E. K. Tedstrom** and **W. L. Rugg** to the positions of assistant to the Treasurer, general storekeeper and assistant to the general storekeeper, respectively.

The magazine *Dixie Business* has named **Norman A. Cocke,** retired president of Duke Power Co, "Man of the South for 1959."

Arthur Lee Humphrey retired recently as senior engineer for Carolina Power & Light Co in the Warsaw and Wilmington area.

George H. Nostrant has been chosen to succeed the late **J. Coleman Jones** as general superintendent of Pacific Power & Light Co.

Russell A. Hedden has become works manager of manufacturing, Industries Group, at Allis-Chalmers' West Allis, Wis., Works.

John Schick has been named senior economist in the Western Division of Arthur D. Little, Inc, in expansion of the research firm's West Coast management services program.

Omer J. De Bever, former chief electrical engineer for Charles Luckman Associates, has established a consulting electrical engineering office in Los Angeles.

General Electric has appointed **A. L. Baldock** marketing manager of its materials dept. The company has named **Dr H. A. Cataldi** supervisor-physical chemistry in the Materials and Processes Laboratory of the company's large steam turbine-generator dept.

Howard D. Tindall has joined Delta-Star Electric Division, H. K. Porter Co, Inc, as manager of transformer sales and engineering.

Westinghouse Electric Corp has named **George E. Richardson** plant manager for its power transformer plant to be built in Muncie, Ind.

Claude Lester, Ruralite Services Inc staffer, has been retained by a joint committee of the Southwest Washington PUD Assn and the Eastern Washington PUD Commissioners' Assn to conduct a study of PUD electric rate patterns, rules and regulations affecting residential and commercial customers.

Everett F. Anderson has been elevated to the position of district engineer for the Los Angeles Division of the Clark Controller Co.

Dr John R. Whinnery, professor of electrical engineering, has been appointed Dean of the Engineering College of the University of California, succeeding **Dean Morrough P. O'Brien.**

OBITUARY

F. Tom Parks, 69, retired vice president and director of Public Service Co of Colorado . . . **Andrew H. Stubbers,** retired president of the Ilsco Copper Tube & Products Co . . . **Richard B. Curran,** 64, financial vice president of the Hartford Electric Light Co . . . **Arthur Davis** of the United Gas Improvement Co . . . **Edward H. Anson,** 56, senior vice president of Gibbs & Hill, Inc. . . . **J. Coleman Jones,** 58, general superintendent of the Pacific Power & Light Co . . . **Laydon Lansing,** 52, area manager for the Niagara Mohawk Power Co . . . **John J. Kearns,** 73, credit manager for the Central Illinois Light Co.

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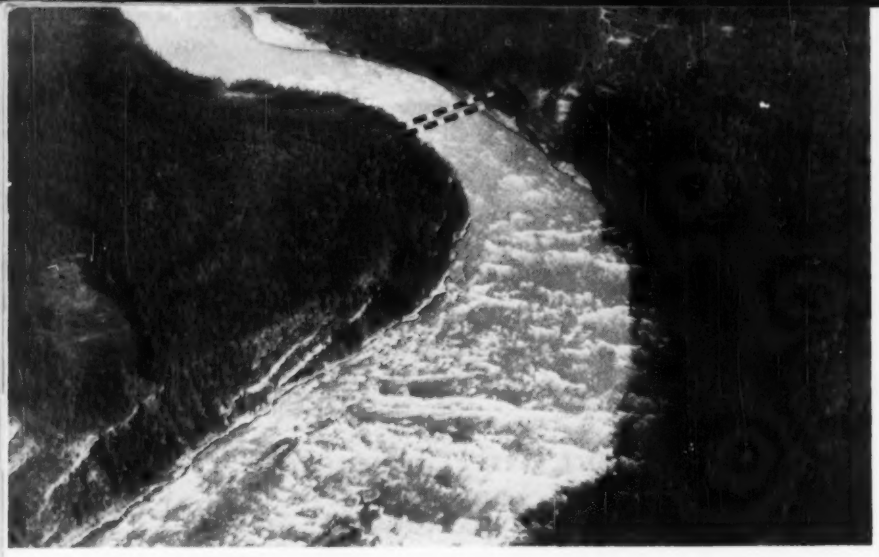
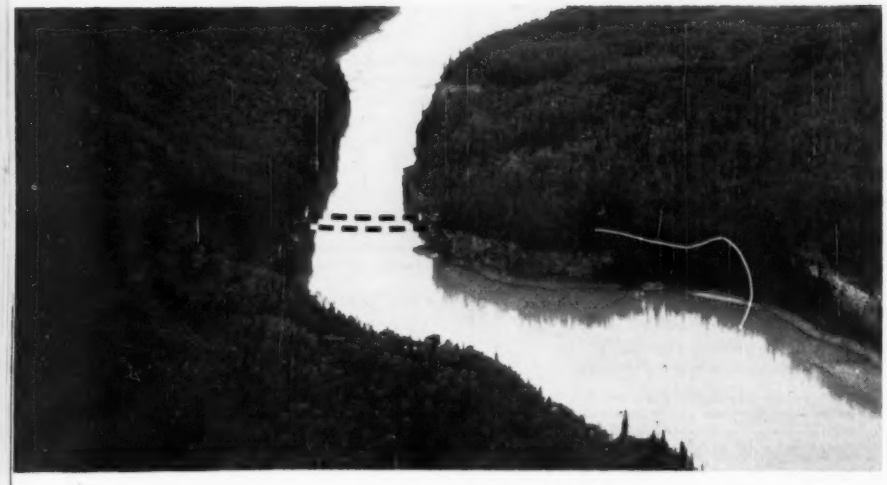


Two Peace River Dams a Good Bet . . .



Engineering Feasibility Study Shows

The 3,145-Mw Peace River hydro project (EW, Oct. 12, p 89) is completely feasible from every standpoint, according to Peace River Power Development Co's final engineering report due to be handed to the Canadian government before the end of this month. A go-ahead from the Canadians could mean first construction would begin next spring.

The 600-ft high upstream dam in the Peace River narrows northwest of Portage Mountain will get first attention from the company if final plans are okayed. Portage Dam (site shown in lower photo) is slated to turn out 805 Mw initially, and will cost $375 million. Until the Peace River area is developed, Portage Dam will feed its power 550 miles to Vancouver, British Columbia, over a 500-kv line.

After completion of a second dam downstream (top photo) total Peace River output can be pushed to 3,145 Mw at a construction cost of $611 million, the company says. But full output probably will not be achieved until 1976—the deadline set by the Canadian government in its agreement. The Peace River region that Canada hopes to develop is rich in oil, gas, coal and timber resources.

Federal Power Grid Sought For Upper Colorado States

Public power representatives of the four Upper Colorado River basin states have pledged to seek construction of federal government facilities to distribute power from Bureau of Reclamation projects in the Colorado River storage project.

The stand was taken at a meeting of preference power users in Salt Lake City last month, according to Howard E. Scott, manager of the Colorado Rural Electric Assn.

Private power companies in the region already have proposed a transmission system to be operated by them (EW, Nov. 30, p 86).

"Our position is that the federal power grid best can meet the terms of the act setting up the storage project," Scott said. He is chairman of the Upper Colorado Basin Preference Users Committee.

While the public power group was agreed on the policy of a federally operated grid, said Scott, "we never did get around to setting down a policy on paper. We'll do that at a later meeting." No future meeting date had been set, he added.

USSR Plans Tidal Project, 2,400-Mw Thermal Station

McGraw-Hill World News—The USSR is planning to build its first tidal power system and has blueprints ready for a 2,400-Mw thermal power plant, Tass said.

A 62-mile long dam is proposed to produce energy for the Urals grid from the tides at Mesen Bay in the White Sea. The dam would be assembled from 3.8-in. reinforced concrete panels and would contain a set of 2,000 turbines.

The project's blueprint also is expected to be used for Lumbowka Bay in the Barents Sea. Output of this second project could fulfill the power needs for Kola Penninsular, Tass said.

The big thermal plant is being designed as a forerunner of future stations of the 2,400-Mw size. A cost reduction of 15% per installed unit is anticipated through use of prefabricated, reinforced construction and a space reduction of over half the size of smaller conventional plants, Tass reported.

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The Meetings Calendar

JANUARY—1960

• **Fourth Annual Live Better Electrically Women's Conference** —Edgewater Beach Hotel, Chicago, Ill., Jan. 7-9.

• **Electric Companies Public Information Program**—Power Progress Dinner, Le Chateau, Savoy Hilton, New York City, Jan. 11; PIP Workshop Conference Committee, Sheraton-Park Hotel, New Orleans, La., Jan. 20.

• **Edison Electric Institute**—Electric Space Heating & Air Conditioning Committee, Washington, D. C., Jan. 11-12; Industrial Relations Committee Jointly Sponsored with the Southwestern Personnel Group, Dallas Sheraton Hotel, Dallas, Tex., Jan. 21-22; Transmission & Distribution Committee, Hotel Soreno, St. Petersburg, Fla., Jan. 21-22; EEI-AGA Taxation Accounting Committees, Sheraton-Jefferson Hotel, St. Louis, Mo., Jan. 25-27.

Society of Plastics Engineers—16th Annual Technical Conference, The Conrad Hilton Hotel, Chicago, Ill., Jan. 12-15.

Industrial Heating Equipment Association—The Warwick Hotel, Philadelphia, Pa., Jan. 18-19.

Electric Council of New England—Transmission & Distribution Committee, Engineering & Operations Division, Armand's Beacon Terrace, Framingham, Mass., Jan. 20.

• **Pennsylvania Electric Association**—Systems Operation Committee, Philadelphia, Pa., Jan. 21-22; Transmission & Distribution Committee, Pittsburgh-Hilton Hotel, Pittsburgh, Pa., Jan. 28-29.

Oklahoma Utilities Association—Accounting Section, Tulsa, Okla., Jan. 22.

National Association of Corrosion Engineers—Fifth Annual Corrosion Control Short Course, University of Houston, Houston, Texas, Jan. 22-23.

Hydraulic Institute—Homestead, Hot Springs, Jan. 25-27.

Canadian Electrical Association—Eastern Zone, Chateau Frontenac, Quebec, Canada, Jan. 25-28.

National Association of Purchasing Agents — Public Utility Buyers Group, Mid-Winter Meeting, Atlanta Biltmore Hotel, Atlanta, Ga., Jan. 31-Feb. 1-2.

American Institute of Electrical Engineers—Winter Meeting, New York City, Jan. 31-Feb. 5.

FEBRUARY

• **Edison Electric Institute**—Prime Movers Committee, Sheraton-Cleveland Hotel, Cleveland, Ohio, Feb. 1-3; Industrial Power & Heating Group, Netherland Hilton Hotel, Cincinnati, Ohio, Feb. 4-5; Electrical System & Equipment Committee, Bellevue-Stratford Hotel, Philadelphia, Pa., Feb. 15-16; EEI-AGA Accounting Conference Final Working Meeting, Sheraton-Cadillac Hotel, Detroit, Mich., Feb. 15-16; Commercial Cooking & Water Heating Committee, Atlanta, Ga., Feb. 18-19.

Instrument Society of America — Instrument-Automation Conference and Exhibit, Sam Houston Coliseum, Houston, Tex., Feb. 1-4.

American Society of Heating, Refrigerating and Air-Conditioning Engineers—Semi-Annual Meeting and Second Southwest Heating and Air-Conditioning Exposition, Baker Hotel, Dallas, Texas, February 1-4.

Fourth National Industrial Electric Heating Conference—Sponsored by The Industrial Electrification Council, Netherland-Hilton Hotel, Cincinnati, Ohio, Feb. 1-4.

American Society for Testing Materials — Committee Week, Hotel Sherman, Chicago, Ill., Feb. 1-5.

Pennsylvania Electric Association—Electrical Equipment Committee, Harrisburg, Pa., Feb. 4-5; Joint Meeting of Relay and Communications Committee, Hotel Bellevue-Stratford, Philadelphia, Pa., Feb. 11-12; System Planning Committee, Hotel Pittsburgh-Hilton, Pittsburgh, Pa., Feb. 15-16.

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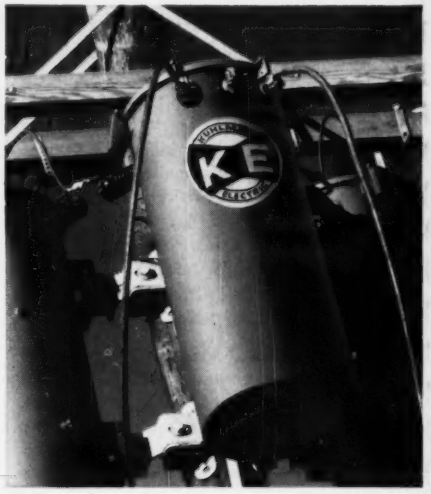
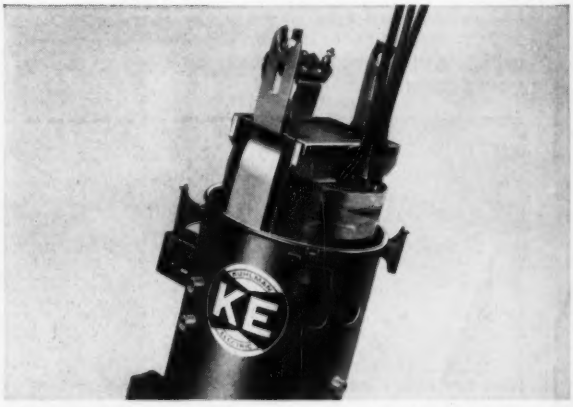
FOUR WAYS TO GET MORE FOR YOUR TRANSFORMER DOLLAR THIS YEAR

REDUCE OPERATING LOSS—New Kuhlman transformers' lower losses conserve generating capacity; put less drain per transformer on your system.



USE SMALLER TRANSFORMERS—to boost KVA per pole. New Kuhlman designs come in smaller tanks. The same KVA now takes up less room on the pole.

IMPROVE REGULATION—to fill new demands of "Electric-Living". New Kuhlman lower impedance, better regulation means less voltage drop and loss of revenue during heavy loading hours.



COMPARE VALUE—This year Kuhlman offers a bigger core and coil in a smaller tank. Result: lower losses, better performance at no extra cost to you.

Get The Most For Your Transformer Dollar. Buy Kuhlman—Now!

KUHLMAN TRANSFORMERS

KUHLMAN ELECTRIC COMPANY, Birmingham, Michigan

Manufacturers of transformers since 1894

PLANTS: Bay City, Mich.; Crystal Springs, Miss.; Salinas, Calif.